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PREFACE

THIS book is intended for pupils preparing for the School Certificate Examination. It was written at the request, and with the co-operation, of a number of teachers of Geography.

The book describes how Man is conditioned by his environment and how he, in his turn, responds to this environment. Thus the emphasis is on the human side of Geography and the main object is to show the nature of the world as the physical home of Man. For should not Geography give, in the words of the Spens Report: 'a conception of the world and of its diverse environments and peoples, which should enable boys and girls to see social and political problems in a truer perspective, and give them sympathetic understanding of other peoples'?

The maps and diagrams have been specially drawn for this book. They are designed to bring out salient facts and are intended to supplement, but not to replace, the maps in a good atlas.

I should like to express my thanks for reading the proofs and for their valuable criticisms to Messrs. G. H. Ely, G. H. Fairs, J. Myers, and to my former colleague on the Board of Education Geography Panel, Mr. J. W. Page; and also to Mr. A. L. P. Norrington of the Oxford University Press.

Sections of the proofs have also been sent all over the world for scrutiny by experts on the spot, as well as to many readers in the British Isles. Among others, I am indebted to the following, who kindly read and revised the sections mentioned in brackets after their names: Mr. W. FitzGerald, Department of Geography, University of Manchester, and Mr. W. D. Johnston, Johannesburg (Africa); Mr. G. E. D. Lewis, Penang (Malaya and the East Indies); Dr. E. Innes, Department of Economics, University of Toronto (Canada); Mr. Joseph Hallett Burlingame, Department of Geography, Milton Academy, Mass. (United States); and Mons. C. M. E. Billecoco (France). I also

received much help from the officials of the Information Departments of the High Commissioners for Canada, Australia, and New Zealand in London; and also from those of the Department of Mines and Resources, Ottawa, who gave me every facility for obtaining information during my recent visit to Canada.

OXFORD, *September 1939* J. H. S.

NOTE TO SEVENTH IMPRESSION

THE conclusion of the Second World War has enabled this book to be brought up to date. It deals with the various countries as established as a result of the Peace Conference of 1946. Teachers and pupils may find useful the following Atlas-Pamphlets (Oxford Pamphlets on World Affairs): *An Atlas of the U.S.S.R.*: *An Atlas of the U.S.A.*; and *An Atlas of the British Empire.*

August 1946

J. H. S.

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The Oxford and Cambridge Schools Examination Board; The University of Cambridge Local Examinations Syndicate; The University of London Matriculation and Schools Examination Council; The Northern Universities Joint Matriculation Board; The College of Preceptors; and to the Controller of H.M. Stationery Office for the Secondary Education (Scotland) Leaving Certificate Examination.

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PART I

GENERAL GEOGRAPHY

CHAPTER I

MATHEMATICAL GEOGRAPHY

The Solar System. The *Earth* is a member of the Solar System. It is one of eight major planets revolving round the Sun, the centre of this system. The planets radiate no light of their own, but shine with that reflected from the Sun. Chief among them are Mercury and Venus, which are nearer, and Mars, Jupiter, Saturn, Uranus, and Neptune, which are farther away from the Sun than the Earth.

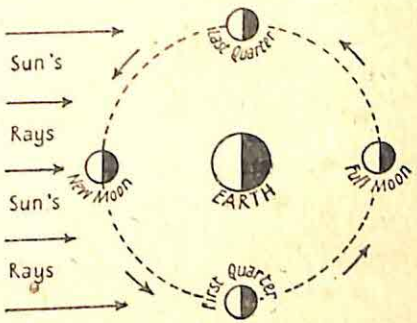

FIG. 1.

The *Sun* has a diameter of 864,000 miles. Though 93,000,000 miles from the Earth, so great is its heat that its rays reach our planet with considerable warming power.

The *Stars*, unlike the planets, are self-luminous bodies. They appear small because they are so far away: the nearest star, Proxima Centauri, is 200,000 times more distant than the Sun. The stars do not revolve round the Sun, but move in circular paths across the sky while maintaining their relative positions. With the exception of the Pole Star, which is practically overhead at the North Pole, the stars on any given night appear to be changing their positions, but these apparent movements are really due to the rotation of the Earth.

The *Moon* is a dead planet. It is about 240,000 miles from the Earth and, as it is thus some 370 times nearer to us than the Sun, it appears almost as big as the latter body. The Moon revolves round the Earth taking approximately twenty-nine days to complete its circuit. The *phases* of the Moon are the result of its position in relation to the Earth and the Sun (see Fig. 1). At new moon, when

the Moon is between the Earth and the Sun, all three bodies are practically in a straight line. At full moon they are again almost in a straight line, but now the Moon is on the opposite side of the Earth from the Sun. When the Moon is in its first and third quarters its direction from the Earth is at right angles to that of the Sun. The Moon's orbit is elliptical and inclined at an angle of 5° to the plane of the Earth's orbit. This explains why we do not have a total *eclipse* of the Sun every time there is a new moon.

The Shape of the Earth. At one time men thought the Earth was flat but now we know it is a globe. Magellan deserves the title of the 'first circumnavigator'; for though he himself died in the Philippines, the crew of his ship, the *Victoria*, arrived in Spain in 1522, having sailed round the world during their three years' voyage. When a ship goes out to sea, as it draws farther and farther from the land, first the hull and then the funnels appear to sink gradually into the water just as if the vessel were steaming downhill. Now seamen tell us that the same thing occurs all over the world: a ship in the far distance appears to be either sinking or rising according as it is sailing from or to the observer. It is therefore concluded that the surface of the Earth is curved, and curved equally, like the circumference of a ball. This conclusion is confirmed by the careful measurements and calculations of men of science. And it is also certain that the Earth is a globe, or sphere—not a perfect sphere, but one very slightly flattened at the top and bottom. The equatorial diameter is 7,926 miles and the polar diameter 7,900 miles.

There are many other proofs that the Earth is a globe. Here is one. When there is an eclipse of the Moon the shadow cast by the Earth on its surface is always curved.

The Size of the Earth. About 2,000 years ago, Eratosthenes, a Greek living in Egypt, calculated the size of the Earth. On Midsummer Day, at noon, he found that the Sun at Aswan was in the *zenith*, that is at a point in the heavens directly overhead. He also found that at the same time, on the same day, the Sun at Alexandria was 7° from the vertical. He knew that the distance from Aswan to Alexandria was 5,000 stadia (10 stadia = 1 English mile), and that the circumference of the Earth was divided into 360 degrees. Thus, by a simple calculation, he obtained his result.

In Fig. 2 *B* is Aswan, with the Sun directly overhead at the zenith (*S*). The line drawn from *S* to *B* goes straight to the centre of the Earth (*C*). *A* is Alexandria, *T* the zenith of Alexandria, *RA* the line of the Sun's rays. $\angle TAR$ (7°), showing the distance of the Sun's rays from the vertical, is equal to $\angle ACB$ at the Earth's centre, which is therefore equal to 7°.

If 7° are represented by 5,000 stadia,
then 360° are represented by $(5{,}000 \times 360) \div 7 = 1{,}800{,}000 \div 7$
= 257,000 stadia, or 25,700 English miles.

This was a remarkable result when we remember that the measuring instruments used by Eratosthenes were not nearly so accurate as those of to-day. The circumference of the Earth is 24,902 miles, or approximately 25,000 miles.

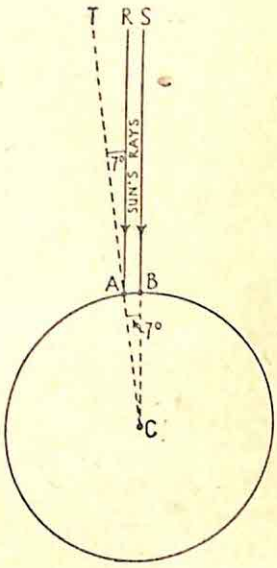

FIG. 2.

The Rotation of the Earth. Though the Earth appears to us stationary, it is, in fact, spinning round on its axis. The axis is, of course, an imaginary line the ends of which we call the North and South Poles. The Earth rotates on its axis once in every 24 hours. It spins from *west* to *east* and, as it rotates, any particular part gradually passes under, and then turns away from the Sun, until at last the latter is no longer visible. Thus the Earth's movement on its axis gives us the phenomena of day and night: any spot on the surface has day when it faces the Sun, and night when it is turned away from it.

The Revolution of the Earth. Besides spinning on its axis, the Earth, as we know, changes its position in the firmament, and moves round the Sun. The path of the Earth round the Sun, called its *orbit*, is not a circle, but an oval or ellipse; and the plane in which the Earth moves is said to be the *Plane of the Ecliptic*. The time taken to complete one revolution round the Sun is one year, or approximately 365¼ days. For convenience sake, one year

is taken as 365 days, except during a Leap Year when one day is added.[1]

The Earth's axis is inclined to the plane of its orbit at an angle of $66\frac{1}{2}°$.

As the axis always points in the same direction, therefore the northern half of the Earth (the Northern Hemisphere) is tilted towards the Sun for half the year, and the Southern Hemisphere during the other half of the year. When the Northern Hemisphere

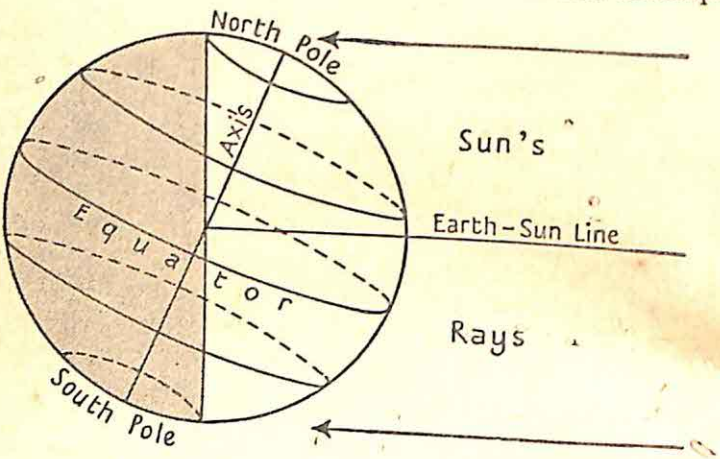

FIG. 3.

is tilted towards the Sun, the North Pole has continuous daylight, but the South Pole is in darkness (see Fig. 3). When the Southern Hemisphere is tilted towards the Sun these conditions are reversed (see Fig. 4). *The seasons are due to the changes of the Earth's position in the course of its revolution about the Sun, and to the inclination of its axis* (see Fig. 6).

The Path of the Sun. The Equator is an imaginary line drawn round the Earth midway between the Poles. Certain imaginary lines north and south of the Equator are called *tropics*, the northern being the Tropic of Cancer ($23\frac{1}{2}°$ N.), and the southern the Tropic of

[1] The actual time to complete one revolution round the Sun is 365 days 5 hours 48 minutes 46 seconds. Leap year occurs every fourth year except at centuries. A century is a leap year when the first two figures are divisible by 4.

Capricorn ($23\frac{1}{2}°$ S.) (see Fig. 5). The word tropic means 'turning place'. At one time men imagined that the Sun turned south on

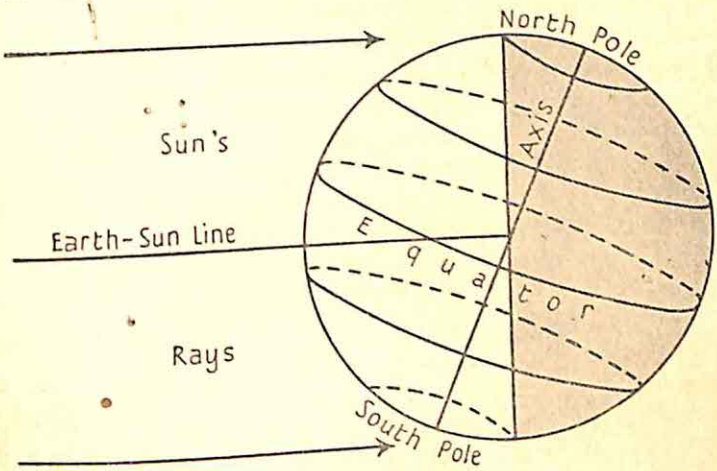

FIG. 4.

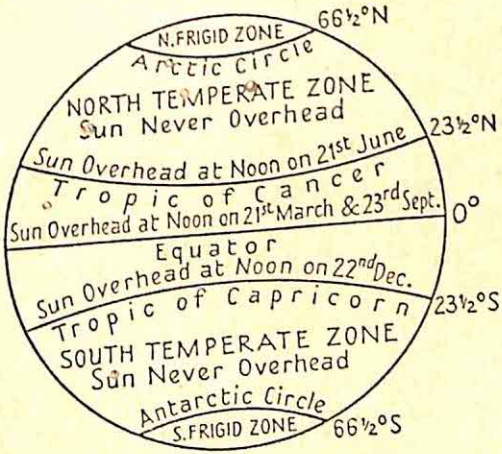

FIG. 5.

June 21st and north on December 22nd. Because the Sun stops its apparent northward movement on June 21st this date is known as the *Summer Solstice* (from a Latin word *solstitium*, meaning the

standing still of the Sun); while for a similar reason December 22nd is called the *Winter Solstice*.

The inclination of the Earth's axis, together with its revolution round the Sun, is the cause of the varying length of day and night in different parts of the world. At the Vernal Equinox (*aequus* = equal; *nox* = night), March 21st, and the Autumnal Equinox, September 23rd, the Sun is overhead at the Equator (Fig. 6). On

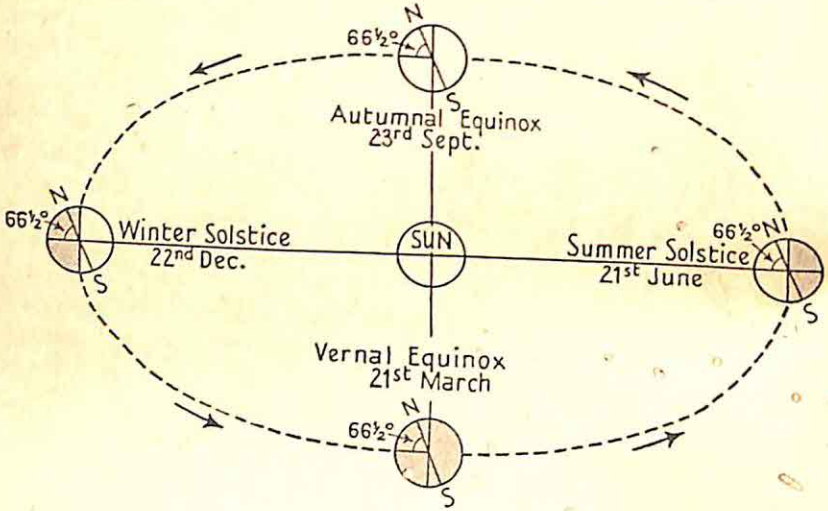

FIG. 6.

these dates, except at the Poles, (*a*) days and nights are equal all over the world; and (*b*) the Sun rises exactly due east and sets exactly due west at all places on the Earth's surface.

At the Equator itself days and nights are equal throughout the year. The Sun rises about 6 a.m. and sets about 6 p.m. There is no twilight. It is almost as if a drop curtain were suddenly let down over the Sun. Throughout the tropics very similar conditions prevail: the length of the days varies little and it gets dark rapidly about 6 p.m.

Between March 21st and September 23rd, when the North Pole is tilted towards the Sun, the days are longer than the nights throughout the Northern Hemisphere. From March 21st till June 21st (when the Sun is overhead at the Tropic of Cancer) the length of the day increases from the Equator towards the North Pole. Each day

the Sun (*a*) rises a little earlier, and a little more towards the north of east; (*b*) reaches a greater height at midday; and (*c*) sets a little later, and slightly more towards the north of west. From June 21st until September 23rd the changes are in the opposite direction, but the days are still longer than the nights. On September 23rd the Sun's path is, of course, the same as on March 21st.

Between September 23rd and March 21st, when the Southern Hemisphere is tilted towards the Sun, conditions are reversed. In the Southern Hemisphere the days are longer than the nights, while in the Northern Hemisphere the nights are now longer than the days.

At the North Pole there is continuous daylight from March 21st to September 23rd. The Sun does not rise or set, but circles round and round in the sky. On March 21st it circles round just on the horizon, and each day it circles somewhat higher until June 21st when it moves round at a height of $23\frac{1}{2}°$ above the horizon. Then gradually its path becomes lower until, on September 23rd, it again circles round just on the horizon, after which it disappears for six months. There are some weeks twilight before March 21st and after September 23rd. The length of the day decreases from six months at the North Pole towards the Arctic Circle ($23\frac{1}{2}°$ N.) where there is only continuous daylight for 24 hours on June 21st.

Similar conditions are experienced in the corresponding Antarctic region from September 23rd to March 21st.

Latitude and Longitude. The position of a place on the Earth's surface can be fixed when we know its latitude and longitude.

Latitude is distance, measured in degrees, north or south of the Equator.

The circumference of the Earth (25,000 miles), being a circle, is divided into 360°. Therefore $1° = 25{,}000 \div 360 = 69\frac{1}{2}$, or approximately 70 miles. This figure is useful in determining the scale of a map.

One of the easiest ways of finding the latitude of a place north of the Equator is to find the *altitude* (the distance angular above the horizon) of the Pole Star, which is the *zenith* of the North Pole, or the point in the heavens directly above the North Pole. Take a telescope and look at the Pole Star through it. The angle made by the telescope with a horizontal line, found by means of a spirit level, will give the altitude of the Pole Star. This altitude is equal to the latitude of the place. As the star is overhead at the North Pole, the

angle through which the telescope would move there would be 90°, which is the latitude of the North Pole. At the Equator the Pole Star is on the horizon, and therefore the angle is 0°, which is the latitude of the Equator.

At sea a *sextant* is used by mariners to determine their latitude. By means of this instrument the altitude of the Sun, and of other heavenly bodies, can be measured. If this angle be substracted from 90°, then the *Sun's zenith distance* (that is, its distance from the vertical) is obtained.

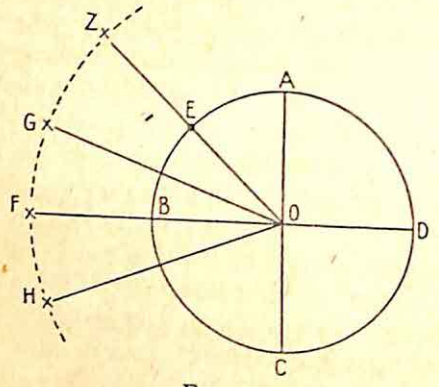

FIG. 7.

Suppose, for example, that the altitude of the Sun, on a certain day, in the Northern Hemisphere, is found to be 60°. Then the zenith distance is $90° - 60° = 30°$.

Each day at noon, ship's officers find, by means of the sextant, the altitude of the Sun. After this has been ascertained, the exact latitude of the vessel is worked out by reference to the Nautical Almanac. This gives the *declination of the Sun* (that is, its distance north or south of the Equator) for every day in the year. In the Northern Hemisphere, on June 21st, the Sun has a *north declination* of $23\frac{1}{2}°$ more than it had on March 21st when it is overhead at the Equator. In the Northern Hemisphere, on December 22nd, the Sun has a *south declination* of $23\frac{1}{2}°$, and thus its height at noon is $23\frac{1}{2}°$ less than it was when the Sun was overhead at the Equator on September 23rd.

In Fig. 7 the circle $ABCD$ represents the Earth; BD the Equator; AC the axis; E the position of an observer.

Arc $HFGZ$ represents a portion of the celestial sphere; Z the zenith of the observer; H the position of the Sun on December 21st; F its position at the Equinoxes; and G its position on June 21st.

(*a*) It is clear that $\angle EOB$, which is the latitude of E, is equal to $\angle ZOF$, i.e. the zenith distance of the Sun at noon on March 21st and September 23rd.

(*b*) Thus, when the Sun is at G, on June 21st, the latitude equals $\angle FOG + \angle GOZ$, i.e. declination + zenith distance.

(*c*) When the Sun is overhead at *H*, on December 21st, the latitude equals $\angle HOZ - \angle FOH$, i.e. zenith distance—declination.

How to find the latitude of places in the Northern Hemisphere by means of the Sun at noon.

(1) At the equinoxes latitude = 90°—Sun's altitude.

Suppose the date to be March 21st.

The Sun's altitude at noon is found to be 37°.

Then the latitude is 90°—37° = 53° N.

(2) Between March 21st and September 23rd the Sun's declination must be added to the zenith distance.

Suppose the date be June 1st.

The Sun's altitude is found to be $60\frac{1}{2}°$.

$\therefore$ 90°—$60\frac{1}{2}°$ = $29\frac{1}{2}°$ (zenith distance).

On June 1st (according to the Nautical Almanac) the Sun has a north declination of 22°.

The place is $29\frac{1}{2}°$ from 22° N.

$\therefore$ the latitude is $29\frac{1}{2}°+22° = 51\frac{1}{2}°$ N.

(3) Between September 22nd and March 21st the Sun's declination must be subtracted from the zenith distance.

Suppose the date be January 1st.

The Sun's altitude at noon is found to be 12°.

$\therefore$ 90°—12° = 78° (zenith distance).

On January 1st the Sun has a south declination of 23°.

$\therefore$ the latitude of the place is 78°—23° = 55° N.

In the Southern Hemisphere the latitude of a place is found in a similar way, except that the zenith distance is subtracted if the Sun has north declination, and is added if the Sun has a south declination.

Determination of Longitude. Just as in finding latitude we measured from a fixed line, the Equator, so too we must have a fixed line, running due north and south, for measuring longitude. Such a line is called a meridian. *Longitude is distance, measured in degrees, east or west of any fixed meridian.*

The Equator is divided into 360 degrees, and on the map, or the globe, lines are drawn through some of these points, at regular intervals, to the Poles. These meridians are all equal circles which cut each other at the Poles. The meridian passing through Greenwich is usually taken as the one from which measurements are calculated. This meridian is numbered 0°. On a globe the meridians are numbered from 0° to 180° west or east. At the Equator the degrees are

approximately 69 miles apart. But obviously the space between any two diminishes as they approach each other towards the Poles, where they cut. Therefore lines of longitude cannot be used to estimate the scale of a map.

As the Earth takes 24 hours to make a complete turn on its axis, the 360 meridians of longitude take 24 hours to pass under the Sun.

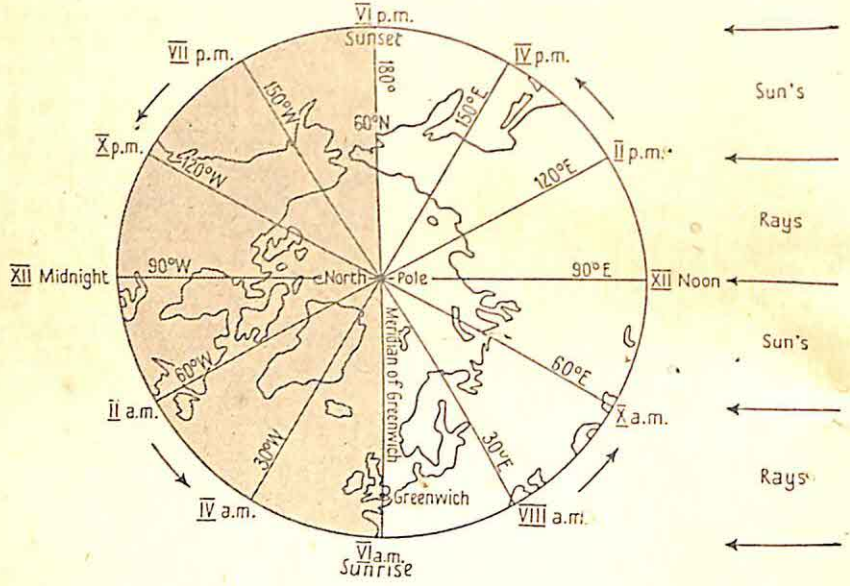

FIG. 8.

Therefore 15 degrees pass under the Sun each hour, and 1 degree in 4 minutes. *It is noon at a place when the meridian of longitude of that place passes directly under the Sun.* Thus all places on the same meridian have their noon at the same time. As the Earth spins from west to east, places east of the meridian 0° pass under the Sun before places west of this meridian. When it is noon at Greenwich, at a place 1° E. it is 4 minutes past noon; i.e. 12.4 p.m.; while at a place 1° W. it is 4 minutes before noon, i.e. 11.56 a.m. Fig. 8 shows part of the Northern Hemisphere as we should see it, at the equinoxes, looking down on it from a point above the North Pole. As the Earth rotates from west to east, dawn is just breaking at Greenwich and the Sun is on the horizon.

When sailors wish to find their longitude, then the time when the Sun crosses the meridian (i.e. when the Sun is at its highest) is noted. Suppose this time is 3 p.m., as shown by the ship's chronometer which registers Greenwich time. This means that local noon is 3 hours *after* Greenwich noon. Therefore the longitude is *west*. The Earth has turned on its axis, since Greenwich noon, through an angle of $(3 \times 60) \div 4 = 45°$. The longitude of the vessel is, therefore,

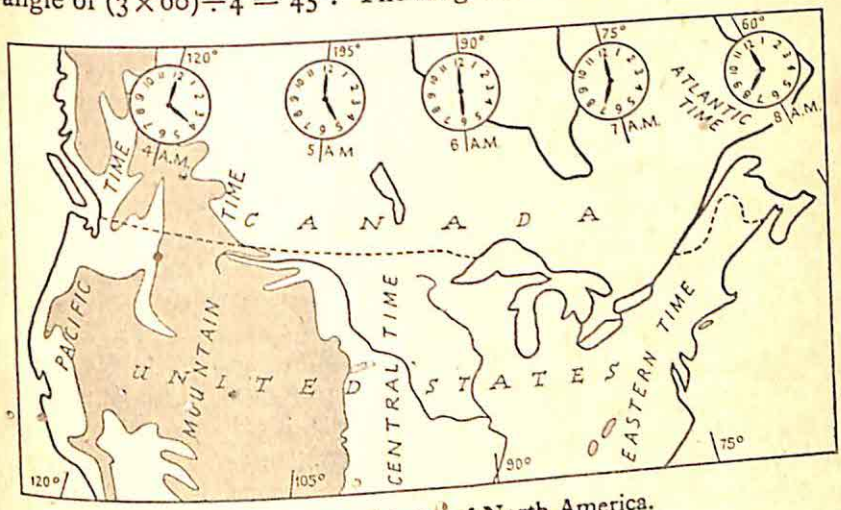

FIG. 9. Time-belts of North America.

45° W. Nowadays, though Greenwich Mean Time (G.M.T.) can be obtained by wireless, ships still carry chronometers. In actual practice, however, the calculation is not quite so simple.

Standard Time. All places in the same area use what is called standard time. Thus clocks in the British Isles are set to Greenwich standard time, for it would be very inconvenient if they followed local time. If, for example, clocks at Fishguard (5° W.) were set by local time, a man travelling from London to Fishguard would find that his watch, showing Greenwich time, was 20 minutes fast when he arrived. Western Europe uses Greenwich time, but Central Europe takes its time from the local time along the meridian 15° E., and Eastern Europe from the meridian 30° E. In Canada there are five time-belts (Fig. 9). In the Atlantic belt the time is taken from the meridian 60° W. In this belt the clocks are 4 hours slow by Greenwich time. The other time-belts of Canada are

Eastern (75° W.), Central (90° W.), Mountain (105° W.), and Pacific (120° W.). There are only four time-belts in the United States.

The International Date Line. If we travelled westward to a place *X*, almost on longitude 180° W., we should find the time there was nearly 12 hours behind Greenwich time. If we journeyed eastward to a place *Y*, almost on longitude 180° E., the time there would be about 12 hours ahead of Greenwich time. Suppose, for example, it is 8 a.m. at Greenwich, on Monday July 16th. Then at *X*, nearly on longitude 180° W., it is almost 8 p.m. on Sunday, July 15th, but at *Y*, almost on longitude 180° E., it is nearly 8 p.m. on Monday, July 16th. Thus *X* and *Y*, both almost on 180°, have approximately the same time, but differ in date by a day. Similarly ships travelling westward round the world (i.e. through 360°) lose a day, while those going eastward gain a day. To overcome the confusion that would otherwise arise, the *International Date Line* has been established. It runs along 180° E. or W. (for these meridians are, of course, the same) and westward-bound vessels crossing it drop a day from the calendar, while those going eastward add a day, by giving the same date to two consecutive days. The meridian 180° was chosen because it passes through the mid-Pacific where, owing to the small amount of land, the change of date causes the least inconvenience. Actually, the line deviates in places from 180° so as to avoid cutting through groups of islands, like the Fiji Islands, where it swings east to include the whole group.

Great and Small Circles. On a flat surface the straight line joining any two points is the shortest distance between them, but on a globe all lines are curved. Such curves, when produced in either direction, form circles. If we cut a globe right through its centre, it will be divided into two equal portions, and the mark made by the cutting line will be the largest possible circle that can be drawn upon the surface. Such a circle is called a *Great Circle*. All great circles on the globe are the same size. Lesser circles, called *Small Circles*, whose planes do not pass through the centre of the globe, can also be drawn upon its surface. The *Equator* is that great circle, drawn midway between the Poles, which divides the Earth into two equal parts called Hemispheres. All other parallels of latitude are small circles. If we examine a globe we shall see, however, that all meridians of longitude are half great circles. *The shortest distance between any*

two places is the route following the arc of the great circle passing through them. Steamers, where possible, follow the arc of a great circle, that is of a circle of which the centre of the Earth is the centre. Similarly, aircraft flying across oceans, such as the Atlantic and Pacific, follow great circle routes. Compare the relative positions of Moscow and San Francisco on a map and on a globe. The globe shows that the most direct way to travel between these two places is by the great circle route, passing through the polar regions, which was, except for certain deviations, followed by Soviet airmen in their epic flight across the Pole in 1937.

The Magnetic North. Helmsmen steer by a mariner's compass. This is a very delicate instrument, but in essentials it consists of a magnetized needle, mounted horizontally on a pivot which allows it to swing freely. When the needle comes to rest one end points to the North Magnetic Pole and the other to the South Magnetic Pole. But these poles do not correspond exactly with the geographical poles. Neither is their position constant. In 1937 the position of the Magnetic North Pole, according to Admiralty charts, was latitude 70° 40′ N., longitude 95° 5′ W. The angle between the magnetic north and the geographical north is called the *magnetic declination*, and in calculating the true (geographical) north allowance must be made for this difference. This is given on maps which show the variation in all parts of the world. In England, in 1913, the compass pointed to a direction some 16° to the west of north, and therefore there was a magnetic declination of 16° W., but in 1931 the magnetic declination was only 13° W.

In Arctic and Antarctic regions the influence of the Magnetic Poles affects compasses considerably, causing them to lose directional force. To offset this, mariners, airmen, and explorers in these regions use compasses fitted with dip needles, which have an up-and-down as well as a roundabout action.

EXERCISES

1. Give three reasons for supposing that the Earth is a ball.
2. Why is it that at the Equator the duration of daylight is almost constant throughout the year, while in the Arctic Circle it varies from 24 hours to zero?
3. State how daylight varies in Britain (*a*) with the summer and winter

seasons, (*b*) with latitude in summer. In each case draw fully labelled diagrams to show the causes of the facts you state.

4. Define (*a*) *latitude* and (*b*) *longitude*. Why are degrees of latitude of equal length and degrees of longitude of unequal length, as measured on the Earth's surface? What is meant by local time? Given that Africa measures 2,400 miles along the Equator, what time is it on the east coast when it is noon on the west coast?

5. What do you mean by: the Zenith Distance of the Sun; the Declination of the Sun; the International Date Line; Magnetic Variation; Great Circle Sailing?

6. (*a*) When it is noon at Greenwich, what is the time at Leningrad (30° E.), New Orleans (90° W.), Melbourne (145° E.), and Calcutta (88° E.)? (*b*) Memphis (U.S.A.) is exactly north of New Orleans. What is the distance between these towns, the latitudes of which are 35° N. and 30° N. respectively? (*c*) On a map of Canada the distance between parallels of latitude 50° N. and 60° N. is 1·75 inches. What is the scale of the map?

7. (*a*) In what time-belts are (i) Montreal, and (ii) Vancouver situated? (*b*) What is the time at Vancouver when it is noon at Montreal? (*c*) When it is noon at Vancouver what is the time at Montreal? (*d*) At what time would the broadcast commentary on an ice-hockey match at Winnipeg, commencing at 8 p.m., be heard at (i) Minneapolis, (ii) Vancouver, (iii) Halifax, N.S.?

CHAPTER II

THE LITHOSPHERE

Materials of the Earth's Crust. The lithosphere, or outer crust of the earth which is not more than ten miles thick, is made up of a great variety of rocks. The term *rock* is applied by geologists to all materials of which the earth's crust is composed, whether they be hard like granite and slate, or soft like sands, clays, muds, and chalk. These rocks affect the type of scenery, the fertility of the soil, the water supply, the kinds of buildings, and the occupations of the people. Rocks are made up of substances called *minerals*. Many of the minerals of which rocks are composed are the raw materials from which metals are obtained. When rocks contain compounds of metals in quantities sufficient to work commercially such compounds are termed *ores*. Ores are often found in mountainous districts where folding or fracturing has brought ore-bearing rocks to the surface. Ores often occur in *veins*, or seams, that may vary from a few inches to many feet in thickness. Thus a seam may be compared to a sandwich between layers of 'country rock', as the ordinary rock found in a locality is termed.

The rock structure can be seen in railway and road cuttings, in quarries and other excavations, in mines, wells, and borings.

(1) Most *sedimentary* rocks were originally deposited in layers on the beds of lakes, seas, and rivers: they are easily quarried and worked. Such rocks include sand and sandstone; clay and shale; limestone and chalk, and others, known as carbonaceous rocks, such as lignite, coal, and anthracite. Since most of these rocks have been formed in seas and lakes, they often contain fossils—the hard remains of animals—which are especially abundant in limestones, chalks, and clays, and are frequently found in sandstones. Sedimentary rocks contain metals, and in some districts alluvial deposits of gold or tin are obtained by *placer mining* and similar methods. *Petroleum* is found in certain sedimentary rocks.

(2) *Igneous rocks* are those which have solidified from the molten condition.

(*a*) When such rocks are poured out on the surface, either through volcanoes or great fissures in the earth's crust, they cool rapidly and

the resultant rocks, which are usually fine grained, are known as *volcanic*. Among the best-known examples is basalt. Sometimes very rapid cooling—as in the formation of obsidian and pitchstone—gives the rocks a glassy appearance (rather like dark bottle glass).

(*b*) *Plutonic rocks* are formed when the molten material solidifies at considerable depths and consequently under great pressure. Rocks, like granite, which are formed in this manner are usually coarsely crystalline. When cooling takes place at a somewhat lesser depth the rocks, such as dolerite, are somewhat finer grained. Denudation, or earth movements, may bring plutonic rocks to the surface, in which case they often form infertile areas like Dartmoor or parts of the Scottish Highlands.

Valuable minerals do not, as a rule, occur in igneous rocks, but they are often found in adjacent areas where they were probably formed by the deposit of mineral matter, due to the cooling of hot solutions and gases, associated with the formation of such rocks. Fossils, coal, and petroleum are never found in igneous rocks.

(3) *Metamorphic*, i.e. *altered rocks*, are the result of long-continued pressure, heat, and other chemical or physical changes. Rocks like slate have been only slightly modified. But the original characters have been completely changed in some metamorphic rocks. As a rule metamorphic rocks, like gneiss and schist—two of the commonest—are hard and resist weathering. They form areas of rugged scenery and scanty infertile soils which, like Scandinavia, Finland, and the Canadian Shield, are thinly peopled. On the other hand, the presence in such regions of valuable minerals, like gold and silver, causes the concentration of a relatively large mining population in a small district.

Soils. The upper layers of rocks weather to form the soil. In most food plants about one per cent. of their total weight is derived from the soil; the rest comes from air and water and depends on climate. A poor soil in a hot, wet climate bears richer vegetation than a good soil in a cold climate. Yet a poor soil will yield good crops if properly fertilized, and a naturally good soil will deteriorate if neglected. The value of a soil depends on its depth, levelness, and on whether it can be easily broken to allow the roots of plants to spread.

In addition to rock waste good soils contain decayed vegetable matter called *humus*. In the natural state all plants decay where they

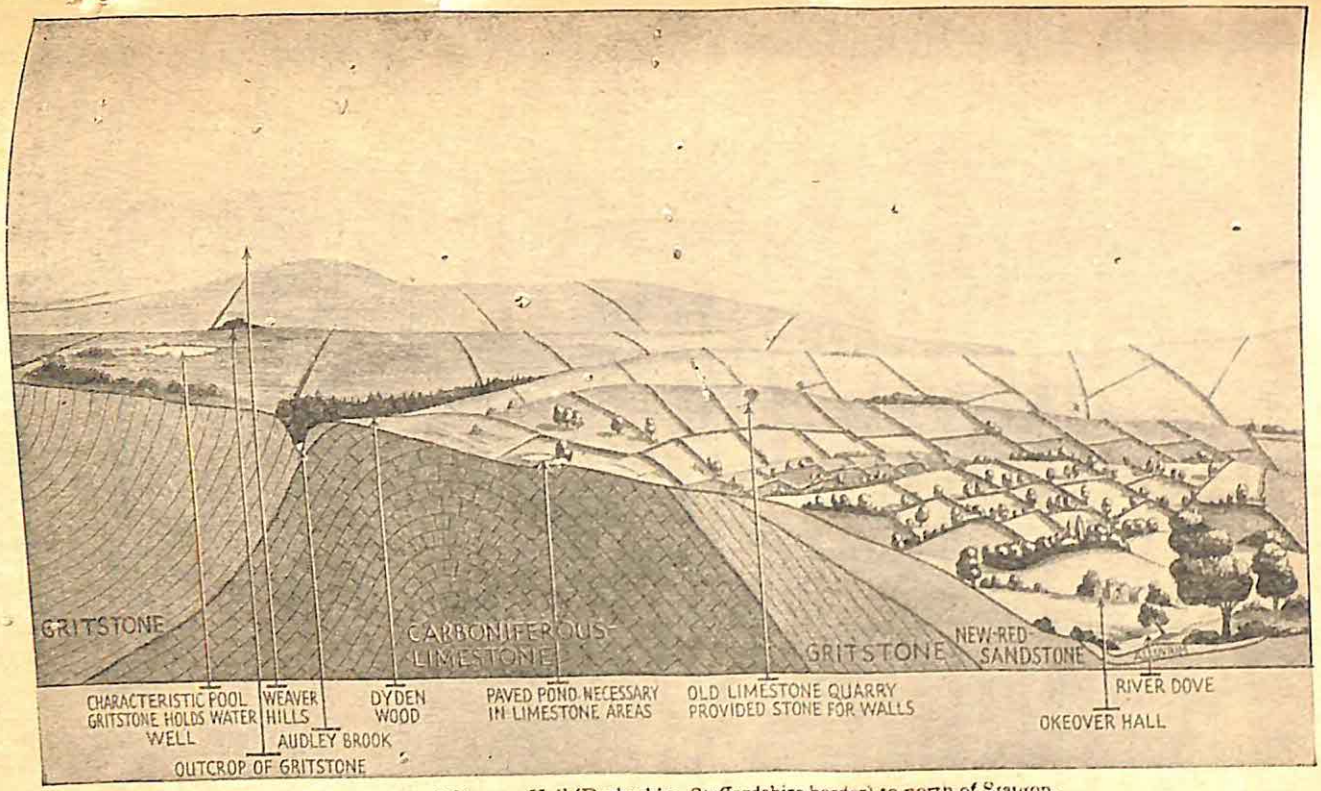

FIG. 10. Geological Section from south of Okeover Hall (Derbyshire–Staffordshire border) to north of Stanton.
Note that (1) on the New Red Sandstone trees are abundant, hedges separate the pastures, and the churches and older houses are built of local stone; (2) on the Carboniferous Limestone stone walls replace hedges as boundaries, trees are few, and as the water sinks easily through the porous rock paved ponds are used to retain moisture for the animals; (3) the Gritstone moors, from 1,000 to 1,200 feet above sea-level, are covered with poor pasture and water collects in hollows in the hard rock forming marshes and bogs. The higher slopes are covered with heather and devoid of trees, and the large moorland fields are enclosed by black Gritstone walls.

grow and thus return to the soil all they have taken from it, as well as valuable products, such as nitrogen, obtained from the air. For this reason virgin lands (such as parts of the Canadian prairies recently brought under the plough) usually yield good crops for a number of years. Sooner or later, however, as the crops do not return to the soil but are carried away for man's use, fertilizers must be used. The rotation of crops has long been practised; lime and animal manures are used to enrich the soil; but in recent years an increased use has been made of fertilizers such as nitrates, potash, and phosphates. Nitrates are obtained from the Atacama Desert of Chile and also by chemical processes; Germany possesses valuable deposits of potash salts; many oceanic islands frequented by wild birds yield guano, a natural fertilizer rich in phosphates. Modern farming is a science, and the demand for fertilizers is an increasing one.

For agricultural purposes soils are usually classed as sands, loams, and clays. As clay soils are impervious, they retain water near the surface, but make good farming land; as do loams, a mixture of sand and clay. Sandy soils are light and porous, and when irrigated are very fertile. The loess plains of Northern China are composed of fine sand several thousand feet thick, probably brought by the wind from the Gobi Desert. Such wind-borne soils, having been derived from different districts, are well mixed, and so contain a variety of those mineral foods necessary for the successful cultivation of crops. In regions like the Canadian Shield the Ice Sheet scraped away the soil; but in many glaciated areas—given favourable climate and relief—the mixed deposits of rock debris cause the soil to yield abundantly. Some soils on the margins of glaciated regions, like those forming the Black Earth Lands of Southern Russia, are often deep and level, and, when enriched by humus, their fertility is great.

The Relative Age of Rocks. Geologists have discovered that rocks differ in age. They have therefore classified them according to their *relative* age. The table (p. 19) is given for reference only.

EXERCISES

1. Describe how Sedimentary, Igneous, and Metamorphic rocks have been formed. Give examples from the British Isles of each type.
2. Name two regions in the British Isles where each of the following rocks are used locally for building purposes: sandstones, limestones, granite, slates, and clays.

Table of Rock Systems

Era	*Rock Groups*	*Chief Rocks (with examples from the British Isles)*	(1) *Land Forms and* (2) *Life*
QUATERNARY.	Recent. Pleistocene.	Alluvium (Fenlands), gravels, and sands.	(1) Period of the great Ice Age. (2) Man and present-day animals appear.
TERTIARY OR CAINOZOIC.	Pliocene. Miocene. Oligocene. Eocene.	Sands and gravels (East Anglia). Absent from Britain. Chiefly clays and sands (Hampshire Basin). Sands, gravels, and clays (London Basin).	(1) Great Earth Movements—Alpine Mountain-building.
SECONDARY OR MESOZOIC.	Cretaceous. Jurassic. Triassic.	Chalk (Downs), sandstones, and clays. Limestones (Portland), sandstones, and shales. New Red Sandstones (Midlands) and marls.	(2) Birds and mammals appear.
PRIMARY OR PALAEOZOIC.	Permian. Carboniferous. Devonian. Silurian. Ordovician. Cambrian.	Red Sandstones, Magnesian Limestone. Coal Measures, Millstone Grit (Pennines), Carboniferous Limestone (Mendips). Devonian and Old Red Sandstone (Cheviots), shales, slates, and limestones. Sandstones, shales, and limestones. Sandstones and slates (Central Wales). Slates and sandstones (North Wales).	(1) Armorican Earth Movements at end of Carboniferous times. Caledonian Mountain-building Movements in Siluro-Devonian times. (2) Reptiles and fishes appear. Invertebrate animals present in Cambrian Era.
PRE-CAMBRIAN (no definite classification).		Sandstones, slates, volcanic rocks, granites, schists, and gneisses (NW. Scotland).	(1) Several periods of Earth Movements.

Note.—The Mountain-building Movements were associated with much volcanic activity.

CHAPTER III

THE CHANGING FACE OF NATURE

THE surface of the earth is undergoing constant change. Sometimes, as in the case of earthquakes and volcanic eruptions, such changes take place with dramatic suddenness, but usually they are so gradual as to be almost imperceptible. The mountains of to-day may become the plains of to-morrow, but so far as Nature is concerned both 'to-day' and 'to-morrow' cover a period of hundreds of thousands, or possibly of more than a million years. Great mountain-building movements result in the formation of mighty ranges; but ice, running water, and other forces of denudation are continually wearing away the land.

TYPES OF MOUNTAINS

(1) **Fold Mountains** (see Fig. 11). In past geological ages disturbances in the Earth's interior have caused crumpling and cracking of the crust. But even now the Earth's crust is in a most unstable condition, especially in certain areas. The great upfolds (anticlines) form fold-mountains, and the downfolds (synclines) longitudinal valleys. Geologically speaking, such mountain systems as the Alps and the Rockies are young fold-mountains, whose scenery is rugged and majestic owing to the fact that as yet they have suffered relatively little denudation.

(2) **Residual Mountains** (Fig. 12). In the course of ages ancient mountains, like the Highlands of Scotland and Scandinavia, have become worn down by prolonged denudation, which has removed the softer rocks, leaving the harder and more resistant ones standing as peaks and plateaus. Mountain regions formed in this way are known as Residual Mountains, or Dissected Plateaus. Still further denudation results in the formation of peneplains (*pene* = almost), such as the Hudson Bay Lowlands.

(3) **Crust-block Mountains** and **Rift Valleys** (Fig. 13). We have already seen that in addition to forming upfolds the crust of the earth also cracks under the strain of accommodating itself to the decreasing size of the interior. Often where such cracks occur the portions on either side slip against each other; one part rising up and

the other slipping down. This slipping movement is known as *faulting*. Cross Fell Edge, overlooking the Eden valley, was formed in this way.

Sometimes two parallel faults occur. The portion between them

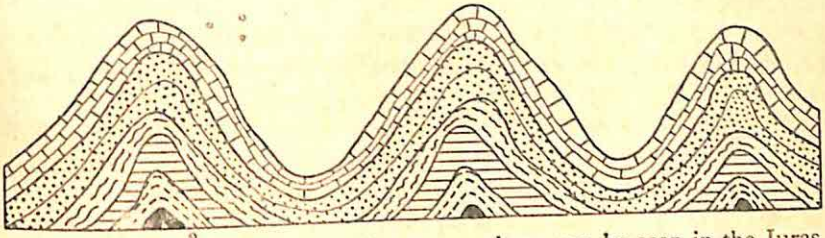

FIG. 11. Fold Mountains: an early stage, such as may be seen in the Juras.

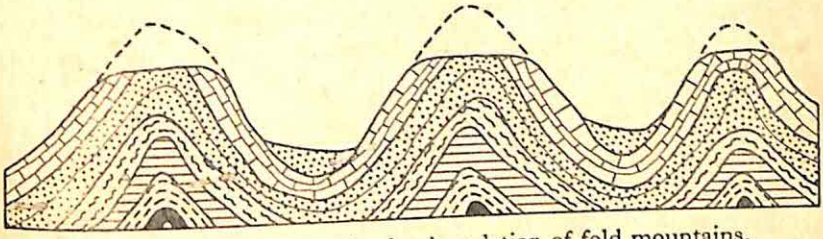

FIG. 12. An early stage in the denudation of fold mountains.

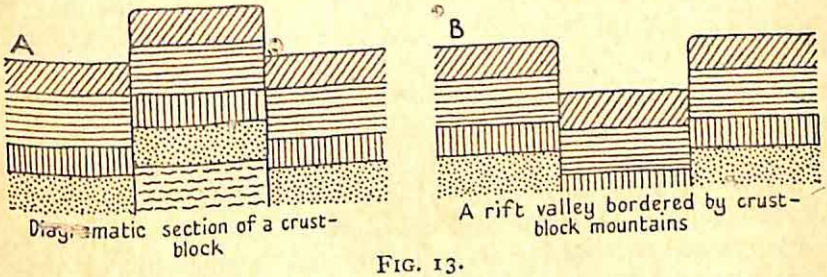

FIG. 13.

may (*a*) either be left standing above the surrounding country while the land on either side subsides, or (*b*) may be uplifted bodily above the adjacent country Elevated mountain masses formed in this way are known as *Crust-block Mountains* or *horsts*. The Central Plateau of France and the Meseta of Spain are examples of this type.

In other cases the strata between two parallel faults subside to form a *Rift Valley*, which thus lies between two parallel sets of crust-block mountains. In this way was formed the Rhine Rift Valley

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between the Vosges and the Black Forest. The greatest rift valley in the world is that stretching from the Jordan-Dead Sea trough, through the Red Sea to Lake Nyasa, in East Africa.

Somewhat similar to crust-block mountains are the great plateaux lying between fold-mountains. Many are of vast extent and lie at high altitudes. Among them may be mentioned the Plateau of Tibet between the fold ranges of the Himalayas and those of the Kunlun; and the Plateau of Bolivia, enclosed by ranges of the Andes.

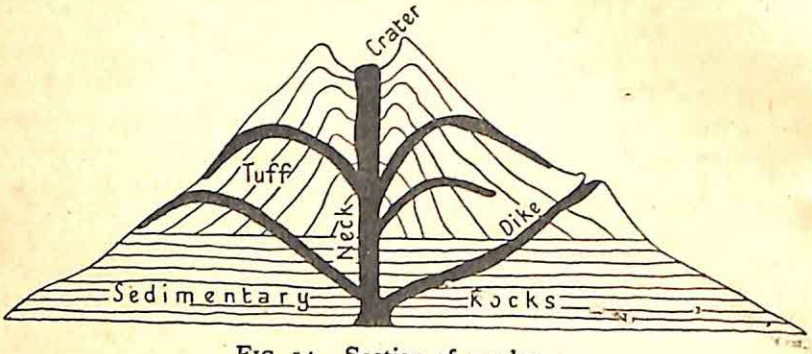


FIG. 14. Section of a volcano.

(4) **Volcanoes** (Fig. 14). A volcano is an opening in the earth's surface through which are erupted steam, gases, molten rock, dust, ashes, and other liquid and solid matter. The accumulation of material around the vent gives to the volcano its typical cone-like shape. The *neck*, through which materials are ejected, may be compared to the stem of a funnel leading to the bowl forming the *crater*.

Some volcanoes are built up almost entirely of cooled lava; others mainly of solidified ash, called *tuff*, and other fragmentary matter thrown out during an eruption. But the majority of cones consist of alternate layers of lava and tuff. Subsidiary cones are often formed at the sides of the volcano. Sometimes the crater becomes blocked up with solidified lava and ultimately the enormous pressure inside blows a portion of the mountain away. This happened in the case of Vesuvius, which is merely the remains of a much greater volcano, known as Somma, a large part of which was blown away in the historic eruption of A.D. 79, when Herculaneum and Pompeii were both buried beneath clouds of volcanic ash.

Distribution of Volcanoes. Most of the world's volcanoes are found

in regions of young fold-mountains whose crests especially have been weakened as a result of earth-movements. Such volcanoes act as safety valves for subterranean energy. Of the 415 active volcanoes in the world no fewer than 337 are found in the fold-mountains margining the Pacific, or on islands in that ocean. Among them may be mentioned those two majestic cones in the Hawaiian Islands, Mauna Loa and Mauna Kea, both of which rise about 14,000 feet above the surface of the ocean. An extension of the Pacific 'Ring of Fire' is found in the volcanoes of Java, Sumatra, and other islands in the East Indies.

Lava-flows. During some geological periods lava has welled up through enormous fissures in the earth's surface. Lava-flows of this type, some 6,000 feet thick, cover an area of about 200,000 square miles in the north-west part of the Deccan Plateau of India, and also form the Idaho Plateau of the North-West United States.

EARTHQUAKES

Volcanic eruptions are often associated with earthquakes, though it is probable that both phenomena have their common origin in deep-seated earth movements. Such movements, due to folding or faulting, may in themselves be slight, but the vibrations they set up are often very great.

The fold-mountain belt around the Pacific is a scene not only of many volcanic eruptions, but also of frequent earthquakes, like that which razed Yokohama to the ground in 1923, and the one in the Hawke's Bay District of New Zealand in 1931. On the other hand, some of the most disastrous earthquakes of recent times, such as the earthquake which utterly destroyed Quetta in 1935, have occurred in regions which, though now free from volcanic activity, lie on the margins of fold-mountain areas.

PLAINS

Plains are due to a variety of causes. *Peneplains* have been formed by prolonged erosion. *Alluvial plains* have been built up by deposits brought down by rivers. The alluvial plain of the lower Mississippi is composed of silt spread by the river over the surrounding land during floods. Very similar are *deltaic* plains, like that of the Ganges-Brahmaputra, which have been formed of sediment deposited at the mouths of rivers to form a *delta*. In some cases, as for example that of the Po, the Tigris-Euphrates lowland, and the Plain

of Hungary, a shallow sea has been filled with river-borne deposits which have converted it into a plain. Many *coastal* plains, like that of the Eastern United States, have been caused by the uplift of the continental shelf.

DENUDATION

The process known as denudation, or the wearing away of the land, is continually going on. (1) Changes of temperature; (2) frost; (3) winds; (4) water, including rivers; (5) ice; and (6) the action of the sea are the chief causes of such erosion.

(1) **Changes of Temperature.** *Heat.* Hot desert regions, such as the Sahara, are subject to considerable daily and seasonal ranges of temperature. This is due mainly to lack of protective covering, which causes the bare ground to heat rapidly, when it is exposed to the fierce rays of the sun shining down from a cloudless sky, and also to become quickly chilled after sunset by radiation. The high temperatures cause the rocks to expand rapidly, for they are not good conductors of heat, and the various minerals they contain have different rates of expansion. At night very rapid cooling results in contraction at varying rates. Thus the alternate expansion and contraction causes the surface layers of the rocks to split and break off. The broken portions are scattered in all directions, smaller pieces are carried by the wind and ground down into grains of sand.

(2) **Frost.** Water, penetrating into the cracks of rocks, expands on freezing and tends to split the rock, causing pieces to break off. In mountainous districts, such fragments tumble down the slopes and collect together to form a pile of loose rock known as *screes*. In the English Lake District, Wastwater is famous for its screes.

(3) **Wind** is an agent of denudation. When laden with sand it scours away the softer portions of cliff faces and other exposed rock surfaces. In certain dry areas in North America, wind erosion has caused much damage. For instance, in the 'dust-bowl', the name given to that part of the High Plains suffering from dust-storms, the soil has been stripped away by wind and the land rendered desolate.

Wind is also a builder-up of the land. In desert regions, or along the coast, it heaps the sand into wave-like dunes. The loess plains of Northern China are composed of wind-borne material (see p. 18).

(4) **Water,** in the form of rain or rivers, plays a predominant part in wearing away the earth's surface.

Rain. The action of rain can be seen on any road after a shower

by observing the muddy water in the gutters; but obviously its effect is greatest in mountainous districts with a heavy rainfall. Rain-water contains carbon-dioxide, which is a powerful eroding agent of limestone. The water dissolves this soluble rock at the joints (cracks), causing it to weather into peaks and pinnacles of fantastic form. In limestone districts rivers often cut deep gorges, like the magnificent Tarn Gorge in South-West France, or Dovedale, a noted beauty spot in Derbyshire. Streams often disappear through sink-holes in the rock, flow underground for some distance, and

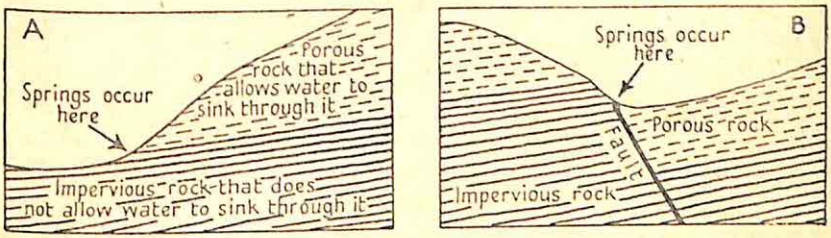


FIG. 15.

gush out at lower levels. As such streams cut their way deeper and deeper through the limestone they form caves, of which Mammoth Cave in Kentucky, U.S.A., the Grottoes of Hahn in South Belgium, and the Cheddar Caves in the Mendips are noted examples. Pendants of stone, called stalactites, hanging from the roof, and corresponding pillars, called stalagmites, rising from the floor are beautiful and sparkling features of such caves. In some limestone districts rivers dissolve the limestone and expand into shallow lakes, known as *solution lakes*, such as Loughs Conn, Mask, and Corrib in Western Ireland. The name *karst* type, applied to limestone regions, is derived from the Karst district of Dalmatia (Yugoslavia) celebrated for this type of scenery.

Rocks like clay, shale, granite, and slates are impervious to water, but others such as limestone, chalk, and sandstone are porous. Rain, after sinking through porous rocks, often reaches an impermeable bed, along which it flows, emerging on a hill-side as a *spring* at the junction of the two types of rock (Fig. 15 *a*).

Springs also occur along lines of faulting (Fig. 15 *b*). In such cases the water descends through the porous strata until it reaches impermeable rock, over which it runs until it reaches a fault, where it is

checked. At this point it forms an underground reservoir. Pressure of the head of water in the strata above may force it to find its way to the surface as a spring. On the other hand, the water may remain imprisoned until tapped for a well. In certain parts of the world *artesian wells* are bored to obtain water lying in underground reservoirs at great depth below the surface.

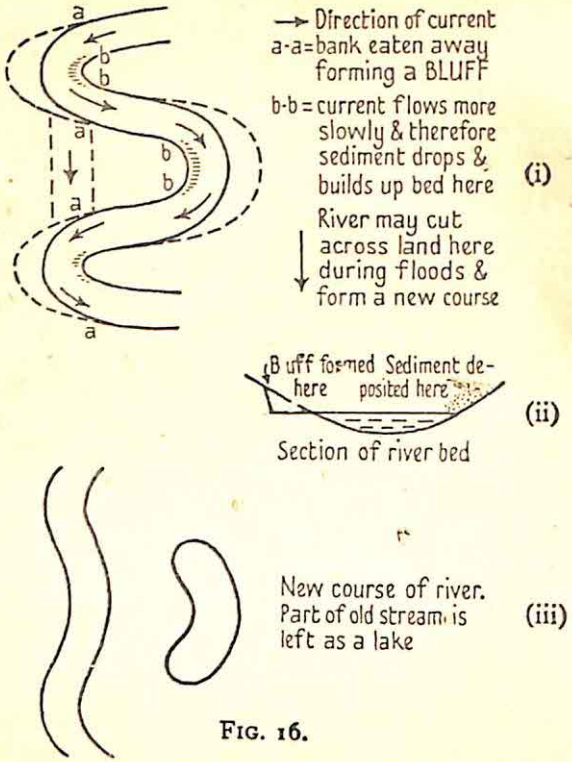


FIG. 16.

Rivers. Running water is one of the greatest agents both of denudation and deposition. When rain falls, some evaporates, some sinks into the ground, and some runs over the surface in little rivulets which gradually unite to form a *collecting basin* whence a stream, draining the basin, issues to form a river. Such collecting basins may be seen in many districts.

In its mountain track a river flows extremely swiftly, cutting deeper and deeper into its valley, and carrying with it not only much sediment, but also rolling along its bed rocks and even boulders

of considerable size. As the rock fragments pound against each other they become smaller and smaller, while at the same time they help both to deepen and to widen the bed of the stream. In its middle course the gradient is usually less and the current consequently less swift. Thus the rocks and pebbles move along more slowly and together with sediment tend to be deposited on the bed.

As the river flows over still flatter land in its lower course, its erosive power is lessened and much sediment is dropped upon its bed, which is being continually raised. In cases like the lower Mississippi or the Po, the stream actually flows at a higher level than the surrounding country, which is protected from inundations by embankments. In flood times, alluvium is spread over the lowlands, so helping to build up a fertile flood plain.

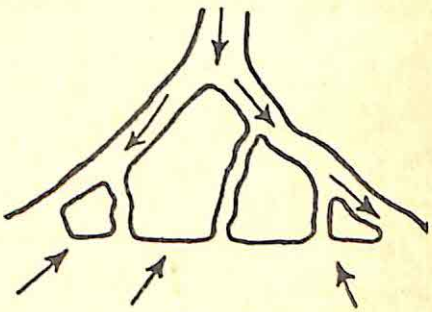


FIG. 17.

In the lower part of its course, owing to the slowness of the current, the stream winds round obstacles instead of cutting through them, and meanders (see Fig. 16) over the plain, forming great curves and bends. The current eats into the outer, or concave, side, cutting away a steep bank or *bluff*. On the opposite, or convex, bank the current is much slower, the sediment is deposited, and the bank built up. In course of time the bends which the river has formed approach each other, and during floods the waters cut across the land between such bends, and by forming fresh channels shorten the river's course. A part of the former river bed is often left as a lake, which, on account of its shape, is called an *ox-bow lake* (Fig. 16, iii).

If the mouth of a river is tidal (i.e. an estuary), the currents scour its bed. In this way they carry the sediment away and, by depositing it over a considerable area, help to keep the channel free for shipping. When the river flows into a lake or a sea, like the Mediterranean, where the tidal range is small, its current is checked, and sediment is steadily deposited at the mouth, thus gradually building up an island which, owing to its resemblance to the Greek letter Δ, is called a delta (see Fig. 17). Despite the fact that their mouths are tidal great

rivers, like the Amazon, form deltas owing to the load of sediment they carry. In addition to the sediment brought down by a river, masses of floating vegetation, and drift carried by currents, also aid in building up the delta, across which in the course of time the river cuts *distributaries* to allow its waters to reach the sea.

How a River Valley is broadened. The typical river valley is V-shaped (see Fig. 18). It is being continually broadened by denudation, but the rate at which this takes place, compared with that at which the river erodes its bed, differs greatly in the various sections of the valley. In its mountain course the cutting-down force of the

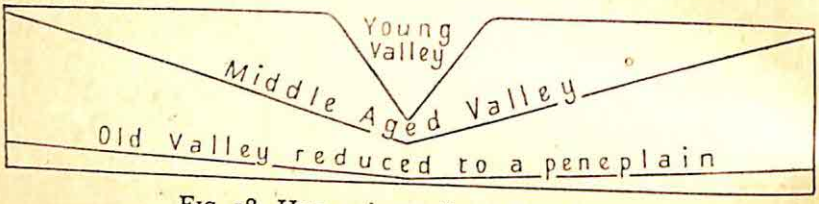


FIG. 18. How a river valley is broadened.

river is much greater than the effect of wind, rain, and frost on the sides of its valley, which are usually steep. In the middle course the erosive effect of the river is lessened, and is more nearly equal to the lateral cutting of the sides of the valley which is consequently somewhat broader. But in its lower course the lateral erosion of the valley is relatively much greater than the vertical cutting down of the river, which indeed now deposits rather than removes material. Thus, while the river builds up the lowlands, the sides of its valley are steadily broadened and their gradient lessened by weathering.

In arid districts, however, there is little or no rain to wear away the valley sides, and the principal erosion is that due to the river cutting its way deeper and deeper through the underlying strata. In such areas deep gorges, called canyons, are formed, of which the classic example is that of the Colorado river, in North America, which has helped to cut a canyon bordered by almost vertical cliffs, some 200 miles long, over a mile deep, and from 4 to 12 miles wide. In part, the formation of the Grand Canyon of the Colorado is due to the uplift of the surrounding plateau.

River Capture (Fig. 19). In their upper courses rivers not only deepen their valleys, but cut them back, thus causing their sources to move farther and farther from their mouths. As this retreating

process continues one river may ultimately *capture* the headwaters of another, causing the upper waters of the weaker stream to be diverted into those of the stronger. In this way the Trent captured the headwaters of a stream that once flowed into the Witham. In South America, the Cassiquiare which flows into both the Orinoco and the Rio Negro, a tributary of the Amazon, provides an example of middle-stage river capture.

(5) **The Work of Ice.** During the Great Ice Age (the Pleistocene period) Northern Europe, including the British Isles as far south as the Thames, the north of North America, and possibly other

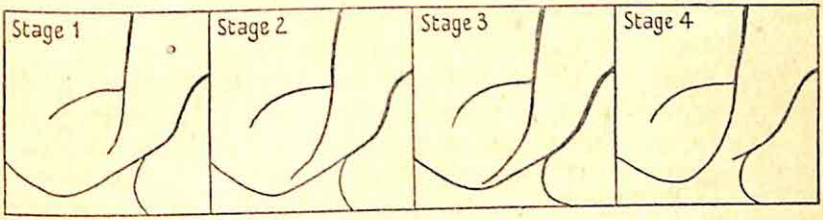


FIG. 19. River capture.

regions were covered by an Ice Sheet which spread over both lowlands and mountains, leaving only the highest peaks rising like islands above its glassy surface.

There were several Ice Ages. When the last Ice Sheet began to melt and disappear, it left behind masses of debris, or *drift*, which was sometimes heaped into low rounded ridges, and sometimes formed great sheets of boulder clay, like that covering a considerable portion of the British Isles, where it has weathered to form fertile agricultural land. In some areas the drift dammed up the normal outlets of valleys, causing the streams flowing into them to expand into lakes, known as *morainic dammed lakes.*

The Ice Sheet also transported great boulders and blocks of rock for considerable distances, and when it melted deposited them in regions quite different from their original homes. Boulders of this type, called *erratics* (or 'wanderers'), are found in many places once covered by the Ice Sheet. At the present time permanent ice and snow are found only in mountainous areas, or in high latitudes such as Greenland and the continent of Antarctica.

Glaciers. In the higher parts of mountain regions are numerous *snow-fields*, formed of accumulations of granular snow known as *névé*,

or *firn*. The lower layers are changed by pressure, condensation, and freezing into solid ice which moves very slowly down the valley as a glacier. In the Alps the average rate of progress of such glaciers is not more than a foot a year. As the glacier moves it collects along its flanks rocks, stones, and other material known as *moraines*. When two glaciers unite, the moraine formed down the middle of

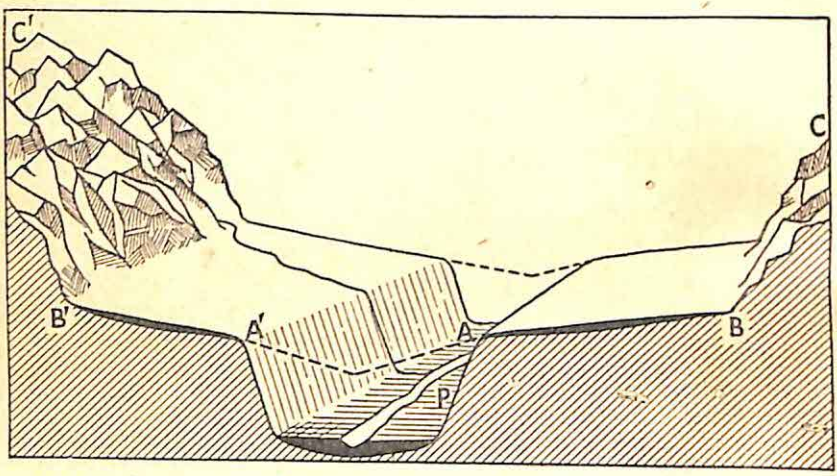


FIG. 20. Section of a U-shaped valley. Dotted line A, A′ shows pre-glacial valley before it was over-deepened by the passage of a glacier. BC, B′C′ are the mountain slopes which rose above the glacier; AB, A′B′ the shelves now covered with glacial debris forming pastures—the *alps*. Streams fall over A and A′ into the main valley. P is the probable site of a power-station.

the united glacier is called a *medial moraine*. When a glacier reaches the snow-line it melts and the rock waste is deposited as a *terminal moraine*, which usually stretches right across the valley. From the *snout*, or end, of the glacier streams descend to the valley beyond: the Rhine and the Rhone both flow out of the glaciers of the St. Gothard group.

U-shaped valleys (Fig. 20). Whereas the typical river valley is V-shaped, one in a recently glaciated region is usually U-shaped, for it has been *over-deepened* by the passage of a glacier. Such a valley has a flat floor and steep sides above which stretch the gentler slopes of tributary valleys. As the latter are said to hang over the main valley, they are known as *hanging valleys*. From these side valleys numerous streams descend into the main valley by waterfalls which

are often used to generate hydro-electric power (Fig. 20 *P*). At the head of many U-shaped valleys there are amphitheatre-like openings, known as *cirques*, or (in Scotland) *corries*, which were once filled by glaciers.

(6) **The Action of the Sea.** Most of us have watched the sea crashing with mighty force against the cliffs. So great is the power of the storm breakers that they smash off big blocks of rock, as well as countless lesser fragments, pounding all into smaller and smaller pieces. Air in cracks and caves is imprisoned and driven inwards by such breakers. On the recoil, the compressed air rushes out and the resulting suction tends to loosen the rock. In this way cracks and caves are being continually enlarged, causing masses of rock to break away from the cliffs. Coastal erosion is mainly due to the action of the breakers. With each high tide the surf hurls pebbles and sand against the foot of the cliffs until their base crumbles away.

The exposed surfaces of the cliffs are subject to weathering, which helps to eat back their faces. In cases where cliffs are formed of porous rock, like chalk or sandstone, resting upon an impermeable rock like clay, rain-water soaks through to the underlying strata and, running along them towards the face of the cliff, undermines the whole structure, with the result that a landslide often occurs.

The more resistant rocks stand out as headlands and promontories whose ends are being constantly worn away. Sometimes masses of rock, cut off from the mainland by erosion, are left standing as *rock stacks*, such as the Needles, off the most westerly point of the Isle of Wight.

Pebbles, gravel, and sand are carried by currents and deposited on the beaches, especially in the bays. In this way the sea straightens out the coast-line; so its action is not merely destructive, but also constructive, for it helps to build up the land. In relatively shallow seas, currents often deposit, along the coast, sand, shingle, and silt in the form of banks or islands. In the English Channel, eastward flowing currents, aided by breakers rolling in from the south-west, have caused a drift of beach shingle along the coasts of Southern England. The Chesil Bank, which connects Portland Island with the mainland, formerly a submarine ridge, is now covered with pebbles piled to a height of some 50 feet.

Along the east coast of England the southward drift of the currents has caused the mouths of a number of rivers to become blocked with sand, forcing them to seek fresh outlets. Thus the

original mouth of the Alde has been closed by a shingle bank, and the river now flows south for 10 miles, parallel to the coast, before entering the North Sea.

Somewhat similar cases occur along the Baltic coast of Germany where shallow openings, called *haffs*, like the Frisches Haff, have been almost enclosed by sand spits, known as *nehrungs*, built up partly of debris carried eastward by currents, and partly of blown sand.

Along some low-lying tropical coasts, such as the east coast of Malaya, mangroves not only protect the land from erosion but assist in building it up. These curious trees spread by dropping their branches into the ground to form fresh roots. Silt brought down by rivers, or carried along by currents, as well as decayed vegetation trapped in the mass of branches and roots, helps to build up alluvial plains. Such plains are, however, usually unhealthy and retard the development of those coastal areas where they occur.

Coral formations also serve to protect the coast. As the coral polyp builds only in calm, clear, warm shallow salt water this type of formation is confined to tropical or sub-tropical seas.

TYPES OF COAST-LINES

Coast-lines are relatively unstable. When the feature lines of the land run parallel to the coast, the latter is said to be *concordant*. When the coast cuts across the grain of the land, it is termed *discordant*. For example, the north coast of Spain, running parallel to the ranges of the Cantabrians, is a concordant coast. The south-east coast of England, which cuts across the grain of the North and South Downs and minor ridges, is a discordant coast. In cases where the grain of the land cannot be definitely related to the direction of the coast-line, the coast is described as *neutral*.

Some coasts are *rising*: others are *sinking*. The presence of raised sea-beaches shows that elevation has taken place. As a general rule straight coasts are rising. Sometimes, as along the west coast of the United States, they are bordered by fold-mountains; but in regions where the continental shelf is broad they are low and flat, and in either case they have few good openings. Sinking coasts, on the other hand, are much indented, for the sea floods the lower ends of the valleys, often turning them into excellent harbours.

In places where mountainous discordant coasts have subsided, the ends of the valleys, which have been 'drowned' by the sea, form

rias, like those found in south-west Ireland and north-west Spain. Such *rias* grow shallower and narrower towards their heads.

Fiords are long, narrow, branching openings, bordered by steep walls, which often extend far inland. There is some dispute as to their origin, but as they are found in recently glaciated regions it seems probable that river valleys, following lines of faulting, were subsequently deepened by glacial action during the Ice Age. Most fiords have a submerged bar across their mouths which is, however, too deep to be an impediment to shipping. They are of considerable depth, and, unlike *rias*, become deeper as one proceeds towards their heads. Fiord coasts are found in Norway, British Columbia, South-West Chile, South-West New Zealand, where they are called Sounds; and in North-West Scotland, where they are known as sea-lochs.

The type of coast-line has a considerable effect on the progress of a region. A discordant coast with its many bays and estuaries favours development. Such a coast is often a nursery of a seafaring people, like the Norwegians, many of whom turned from a rather inhospitable land to seek their livelihood on the ocean.

TYPES OF LAKES

Lakes are due to a variety of causes. In some cases their origin is relatively simple: in others it is complex. Among the chief types of lakes are the following:

(1) *Mountain Ribbon Lakes* are long, narrow, and usually very deep. Their formation is probably due partly to the work of rivers and partly to glacial action. Examples are Loch Tay and most of the larger lakes in the Scottish Highlands; Lake Geneva and other Alpine lakes. Smaller lakes of this type, of which many are found in Scotland, are known as *Rock Tarns*.

(2) *Solution Lakes*, such as Lough Allen, on the Shannon, have been formed by the dissolution of limestone (see p. 25).

(3) *Rift Valley Lakes*, lying in the bed of a rift valley, include such as Lakes Tanganyika and Nyasa in Central Africa (see p. 22).

(4) *Morainic Dammed Lakes*. Loch Leven, in Fifeshire, and the Lower Lake of Killarney, in South-West Ireland, are examples of this type (see p. 29).

(5) *Crater Lakes*, as their name implies, occupy the craters of extinct volcanoes. Well-known examples include Lake Avernus, near Naples, and Crater Lake in Oregon, U.S.A.

(6) *Raft Lakes* are formed by the temporary damming up of the normal outlet of a river. Tributaries of the upper Nile are often dammed up by floating vegetation, called sudd, which converts them into lakes. Such lakes are short-lived for owing to the high temperature they are exposed to great evaporation, while at the same time the river eventually finds an outlet through the sudd. In other cases the temporary barrier to the normal drainage may be caused by blown sand, ice, or lava flows.

(7) *Ox-bow Lakes* (see p. 27).

Lakes are, of necessity, temporary features of a region, for rivers (*a*) tend to fill them up by depositing sediment on their beds, and (*b*) by cutting down their outlet, lower their level.

The *uses of lakes* are many and varied. They tend to check floods and so indirectly help to prevent great loss of life and material damage. Lake Constance checks the floods of the Rhine; Lake Geneva those of the Rhone; while in China, Lake Poyang reduces the floods on the Han, a tributary of the Yangtze river. By causing them to deposit their sediment, lakes act as filters for rivers. The Rhine enters Lake Constance as a turgid river, but issues from it as a clear stream. Vast sheets of water, like the Great Lakes, provide valuable means of transport. The fisheries of such lakes are of considerable economic importance. In many countries natural and artificial lakes are used as reservoirs. Lakes also supply water for *irrigation*. In some cases they are tapped for hydro-electric power. If lakes are of considerable size, like the Great Lakes, they increase the rainfall and moderate the temperature of surrounding areas.

EXERCISES

1. What do you understand by the terms (*a*) rock, and (*b*) mineral? Name the three main groups of rocks. Describe briefly how each has been formed and give examples of each.
2. What are the chief causes of the formation of lake basins? Illustrate your answer by examples.
3. How are fold mountains formed? Give examples. Why are such areas often associated with volcanic activity?
4. Write short notes on (*a*) canyons, and (*b*) U-shaped valleys. In each case draw a contour map of the valley. Illustrate your answer by examples.
5. What do you mean by *river capture*? Give examples and diagrams.
6. Describe two very different types of coast-line, and say to what causes each is due.

CHAPTER IV

THE ATMOSPHERE

General Characteristics of the Atmosphere. The air is composed mainly of nitrogen (78 per cent.) and oxygen (21 per cent.), with small proportions of carbon dioxide, water gas (water vapour), and rarer gases like argon, and neon, made familiar to us by its use for neon signs. The nitrogen serves to dilute the oxygen which is essential for living organisms. Plants absorb carbon dioxide, extract the carbon, and return the oxygen to the air. The water vapour present in the air is of great importance, especially as regards its relation to weather and climate.

The belt of air which envelops the earth forms the atmosphere. It is estimated that the atmosphere is 100 or possibly 200 miles thick, but nine-tenths of the air composing it is found within 12 miles, and half within $3\frac{1}{2}$ miles of the earth's surface. We are concerned only with the lower layer, or *troposphere*, which extends for some 6 miles. The upper layer, or *stratosphere*, is, so far as we know, of little practical importance, though it affects radio reception.

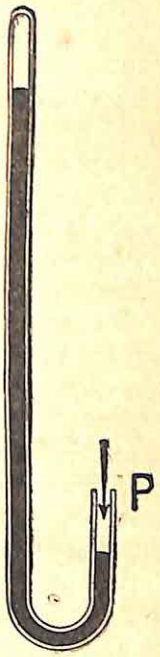


FIG. 21.

The air nearest the earth is compressed by the weight of the remainder of the atmosphere resting upon it. So great is the pressure that at sea-level it is equal, on an average, to 14·7 pounds to the square inch, but as this pressure is exerted equally in all directions we do not feel it. Such pressure, expressed as a height, is measured by a barometer. One of the simplest kinds is shown in Fig. 21. The long branch of the tube is closed to the air. The short branch is open and the pressure of the air at *P* supports a column of mercury. At sea-level the pressure of the atmosphere will support a column of mercury 29·9 inches (or 760 mm.) high. It should, however, be clearly understood that, even at sea-level, pressure varies. If the pressure be low, the height of the barometer may stand at only 28 inches; if the pressure be high the barometer

may show a reading of 31 inches. Pressure decreases with increasing elevation, for the air naturally becomes less compressed as the weight of the atmosphere resting upon it decreases. At ordinary elevations the mercury in the barometer falls 1 inch for every 900 feet of ascent, but at greater heights the pressure does not diminish nearly so rapidly. At an elevation of $3\frac{1}{2}$ miles the pressure is half that at sea-level. This decreasing pressure, due to rarefied air with a corresponding decrease in the proportion of oxygen, is a cause of great discomfort to mountaineers, resulting in dizziness, headaches, sickness, and nose-bleeding. Climbers, like some of those who have attempted to conquer Everest, and scientists, like Professor Picard, who ascend to study the stratosphere, are furnished with special supplies of oxygen.

Pressure and Winds. *Wind is air in motion.* The chief cause of wind is difference in atmospheric pressure. When air is heated it expands, becomes lighter, and rises. When air is cooled it contracts, becomes heavier, and falls. One of the main reasons for differences in pressure is unequal heating of the air. Pressure varies greatly over different parts of the earth's surface, and also from day to day in any particular district. But there are certain permanent belts of high and low pressure over the earth's surface. From the high pressure belts the air, of course, flows outward to the regions of low pressure.

(1) Around the *Equator* there is a region of *low pressure* with rising currents of warm moisture-laden air. Such ascending air currents, over hot regions, are called convection currents.

(2) Low pressure areas also occur about latitudes 60° N. and 60° S., that of the North Atlantic being known as the *Icelandic Low.*

(3) About latitudes 30° N. and 30° S. there are permanent belts of *high pressure* from which the air flows towards the low-pressure belts (*a*) round the equator, and (*b*) those round 60° N. and 60° S.

Both the high-pressure and low-pressure belts are regions of calms. The calms about 30° N. and 30° S. are known as the *Horse Latitudes.* Those round the equator are called the *Doldrums.* The calms around the Poles are termed the *Polar Calms.*

The Wind Belts. Owing to the rotation of the earth, the winds do not blow due north and south from the belts of high pressure to those of low pressure, but are deflected. In this deflexion they obey

Ferrel's Law which states that: *Any moving body on the earth's surface, including a current of air, tends to be deflected, the deflexion being to the right in the northern hemisphere, and to the left in the southern hemisphere.* [This law should be learnt by heart.]

There are four well-marked wind belts. (1) The *westerly variables*, and (2) the *brave west winds*, which blow from the high-pressure belts round about latitudes 30° N. and 30° S. respectively, to the

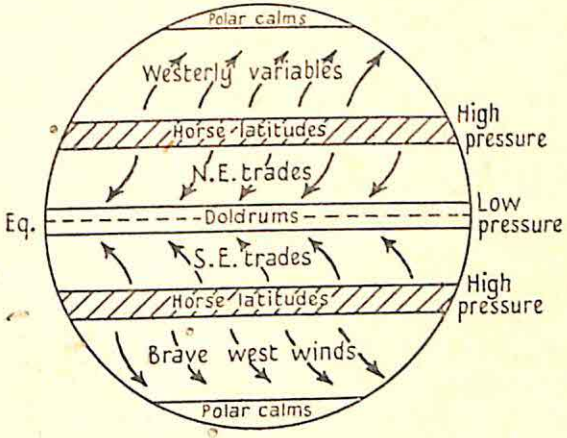


FIG. 22.

low-pressure belts in the polar regions. (3) The *north-east trades*, and (4) the *south-east trades* which blow from the high-pressure belts round about 30° N. and 30° S. respectively towards the Equatorial Belt.

The diagram (Fig. 22) shows the position of these belts when the sun is overhead at the equator. The wind belts move north and south with the apparent movements of the sun. But though the position of the noon overhead sun varies from 23½° N. on June 21st to 23½° S. on December 23rd, the belts of winds and calms move in the same direction only approximately 5°.

The unequal distribution of land and water affects, to some extent, the arrangement of the wind belts. Large bodies of water are not subject to such great changes of temperature as masses of land. Thus in the Southern Hemisphere, where a much larger expanse of the earth's surface (especially south of 30° S.) is covered with water than in the Northern Hemisphere, the winds are more constant. The

brave west winds are stronger and more regular than the corresponding westerly variables of the Northern Hemisphere.

The presence in summer of low-pressure regions in the interiors of continents like North America and Asia, is due to their greater heat relative to the surrounding oceans. This affects the direction of the winds. In winter the interior of these continents are regions of great cold and high pressure, and this too alters the direction of

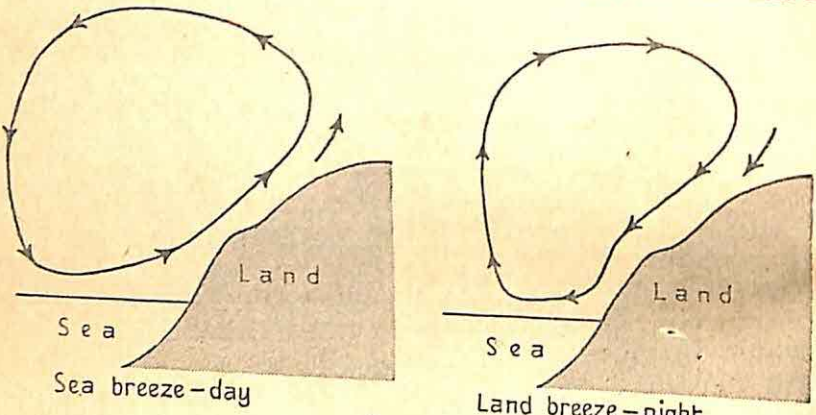


FIG. 23.

the winds by causing them to blow outwards from the land towards the oceans.

Land and Sea Breezes. These local winds, due to the unequal heating of land and water, and consequently of the air above their surfaces, well illustrate the relation between pressure and winds. During the day the land becomes very much hotter than the sea, with the result that there is marked low pressure over the land. Thus the heavier and denser air over the sea flows towards the land (Fig. 23). At night these conditions are reversed. The land rapidly loses its heat and becomes an area of high pressure. During the day the sea has gradually been growing warmer, and as it does not lose its heat nearly so quickly as the land, it remains warm for a longer time, and the air over it, being relatively warm and light, forms an area of low pressure. Thus at night, heavy cool air blows from the land to take the place of warm air rising over the sea. Land and sea breezes are most frequent during fairly settled weather.

The *Monsoon*, or seasonal winds, of south-east Asia, which are especially well marked in India, may be regarded as land and sea breezes on a large scale, in which the period is a year instead of a day (see p. 262).

EXERCISES

1. What do you mean by an area of high pressure? Show, by means of a diagram, the position of the chief high- and low-pressure belts over the earth's surface.

2. Illustrating your answer by a diagram, give a general account of the chief planetary winds.

3. Write short notes on the doldrums, horse latitudes, Ferrel's Law, and the troposphere.

4. Describe, giving your reasons, the course of a sailing ship travelling from Australia to England. Give a map to illustrate your answer, and on it show the direction of the prevailing winds.

5. Trading dhows (sailing boats) make regular journeys between the Persian Gulf and Zanzibar. State, giving your reasons, at what season you think such boats would sail from the Persian Gulf to Zanzibar, and at what season you think they would make the return journey.

CHAPTER V

THE OCEANS

If we look at a globe we shall see that a great proportion of the earth's surface is covered with water which forms a connected expanse divided into oceans; and that, of the land area, by far the larger part lies in the Northern Hemisphere. It is estimated that 72 per cent. of the surface of the globe is covered with water, which fills the deep hollows in the earth's crust and separates the continental masses.

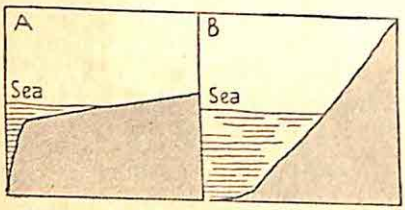


Fig. 24. A. Broad Continental shelf. B. Narrow Continental shelf. Coast bordered by steep mountain range.

The edges of the continents are covered with shallow waters, not more than 100 fathoms deep, beneath which lies the *Continental Shelf*. The slope of the shelf is usually gentle, but beyond the 100-fathom line it descends steeply to the bed of the ocean. This line, called the *Continental Edge*, marks the original coast-line. The steep slope beyond is known as the *Continental Slope* (Fig. 24).

In most areas where the coast of a continent is bordered by mountain ranges the continental shelf is narrow; its edge lies close to the shore-line, and its slope continues the line of the mountains. But where the land slopes gently to the shore-line the gradual gradient is continued beneath the sea, and the shelf is broad. Much of the waste of the land, brought down by rivers, is spread over the continental shelf, where, directly or indirectly, it provides food for marine life. This is one of the reasons why the world's chief fishing-grounds, such as the Grand Banks of Newfoundland and the North Sea, are found where shallow waters cover a wide continental shelf.

THE OCEANS

Antarctica is surrounded by the *Southern*, or *Antarctic Ocean*, which beyond latitude 60° S. merges into the Pacific, Atlantic, and Indian Oceans.

The *Pacific*, greatest of all oceans, covers a third of the earth's surface, its total area being greater than that of all the dry land. Its basin contains some of the greatest known depths. So deep are some portions that if Mount Everest were sunk therein the summit would not only be submerged, but would lie 3,000 feet below the surface. The waters of the Pacific wash the western coasts of the Americas and the eastern coasts of Asia and Australia. But though open to the Southern Ocean on the south, it is almost closed on the north, where the narrow Bering Strait, separating North America from Asia, links it with the Arctic Ocean.

The Pacific is bordered by fold-mountains whose weakened crests contain numerous active and extinct volcanoes. This mountain girdle includes the Rockies and Andes of the Americas, and the island-fringe of Asia which represents the higher portions of a partially submerged fold-mountain range.

The countless islands strewn over the south-west Pacific can be divided into *High* volcanic islands, such as the Hawaiian Islands, Tahiti, and Samoa; and *Low* coral islands, like the Marshall and Gilbert Islands. These islands yield a variety of tropical products and some are important as naval and air bases and as cable and wireless stations.

The *Indian Ocean* is bounded by Africa on the west, by India and Indo-China on the north, and Australia and the East Indies on the east. Ceylon and Madagascar are continental islands which are probably the remains of an ancient continent.

Though the *Atlantic* is slightly less than half the size of the Pacific, yet so many great rivers flow into it that it receives half the drainage of the world. On the west it washes the shores of the Americas, on the east those of Europe and Africa separated by the narrow Strait of Gibraltar leading to the Mediterranean. From the Southern Ocean the Atlantic narrows somewhat towards the Equator, where the western wing of Africa is separated from the most easterly point of South America by a passage, some 1,500 miles wide, crossed by the air route from Western Europe to South America. Of all oceans the Atlantic is the most important. Round its coasts and those of its subsidiary seas, such as the North, the Baltic, and the Mediterranean in the east, and the Gulf of Mexico in the west, stand most of the world's great ports, linked by trade routes more frequented than those of any other ocean.

The *Arctic* lies to the north of North America and Eurasia. It is connected with the Atlantic by a wide passage, in the midst of which stands Iceland; and which is defined by Greenland on the west and Scandinavia on the east. Northward the Arctic extends across the frozen seas surrounding the North Pole to the Pacific, with which it is linked by the Bering Strait.

THE BED OF THE OCEAN

The average depth of the ocean is 12,500 feet compared with the average height of the land which is about 2,500 feet. Protected from erosive forces, which play so great a part in moulding the surface of the land, the greater part of the deep-sea plain is stated to be nearly level, a feature of some practical importance, for it has facilitated the laying of submarine cables. In places, however, earth movements have caused the formation of submarine ridges and vast hollows, called deeps, of which the greatest yet known is that found in the Atlantic, 80 miles to the north of Porto Rico where, in 1933, a depth of 44,000 feet was recorded. Many such deeps are found in the Pacific, especially near the edges of the ocean. Among them are the Albatross Deep, south of the Aleutian Islands; the Tuscarora Deep, south-east of the Kurile Islands; the Nero Deep, east of Guam; the Penguin Deep, east of the Kermadec Islands; the Mindanao Deep, east of the Philippines; and the Atacama Deep, off the south-west coast of South America.

Among the best known ridges is an S-shaped ridge running from north to south through the mid-Atlantic. In the North Atlantic it is known as the Dolphin Ridge, and in the South Atlantic as the Challenger Ridge.

SALINITY OF THE OCEANS

Though sea-water is always salt the percentage in it varies. In the great oceans every 1,000 parts of sea-water contains on an average 35 parts of dissolved salts, but in some areas this proportion is as high as 37 and in others as low as 30 parts per thousand. When sea-water is evaporated the greater part of the solid matter left behind consists of common salt. In certain warm countries, like India, salt is obtained by allowing sea-water to evaporate in shallow lagoons.

Rain-water is free from salt. In regions where the rainfall is exceptionally heavy, the surface salinity of the ocean is less than in

areas of lower rainfall. Ice contains relatively little salt, and so the water from icebergs reduce the salinity of the seas in areas, such as the North Atlantic, where they melt.

The surface salinity of the ocean in the Equatorial Belt is relatively low (35 to 34 per thousand) owing to the addition of fresh water through heavy rains. In the high-pressure belts around the Tropics of Cancer and Capricorn, the surface waters of the ocean are very salt (36 parts per thousand) on account of the great heat and consequent evaporation, and the comparatively low rainfall. In higher cooler latitudes the surface waters are comparatively fresh, as there is less evaporation and more rain than in the region around the Tropics. In the North and South Atlantic, for example, the surface salinity varies from 35 to 32 per thousand. It is lowest (32 per thousand) in the seas between Labrador and Baffin Land on the west and Greenland on the east, where water from melting icebergs increases the freshness of the sea-water. For the same reason the surface salinity in the Polar Seas is only about 30 per thousand.

Very high salinities are found in enclosed or partially enclosed seas subject to great evaporation. In the Red Sea and the Mediterranean the surface salinity is 40 per thousand, while the waters of the Dead Sea actually contain 225 parts of dissolved salts per 1,000.

On the other hand, in seas like the Baltic, fed by vast quantities of river-water, and not subject to great evaporation, the salinity is very low. In the south it is about 8 per thousand, while in the Gulf of Bothnia it is as low as 2 per thousand. This freshness of the water partly explains why the Baltic freezes more readily than the Mediterranean, which has relatively few large rivers entering it, and which, on account of its lower latitude, is subject to greater evaporation.

TEMPERATURE

The surface temperature of the ocean diminishes from the equator to the poles. In equatorial regions it is about 80° F. In partially enclosed tropical and sub-tropical seas, like the Gulf of Mexico, the waters are somewhat warmer than those of the open ocean in similar latitudes, but in seas in higher latitudes, like the Baltic, temperatures are less than in corresponding latitudes in the open ocean. Temperatures decrease with increasing depth below the surface. This fall is usually rapid at first, but diminishes with greater depth, and below 6,000 feet temperatures are fairly constant at about 35° F.

OCEAN CURRENTS

Currents of the Atlantic. The North-East and South-East Trade Winds drive two currents, known as the *North Equatorial* and the *South Equatorial*, across the Atlantic from the shores of Africa towards the Americas. The North Equatorial divides into two portions on approaching the West Indies: one branch running north of these islands, the other through the Caribbean Sea into the Gulf of Mexico. The South Equatorial Current divides on reaching the projecting coast of South America: one branch runs south as the warm *Brazil Current* along the coast of Brazil, but on reaching the latitude of the westerly winds it is driven east to the shores of Africa. It then turns north and, as the cool *Benguela Current*, flows north along the west coast of Africa and rejoins the South Equatorial Current. The northern branch of the South Equatorial Current flows along the north coast of South America, through the Caribbean Sea (where it reinforces the North Equatorial Current), and into the Gulf of Mexico. The piling up of waters off the north coast of South America by the equatorial currents causes a counter current, known as the *Guinea Current*, to run eastwards into the Gulf of Guinea, around which it flows until it rejoins the South Equatorial Current.

The heaping up of waters in the Gulf of Mexico causes the *Gulf Stream* to flow out through the Florida Strait. This warm current moves at a speed of some 4 miles an hour along the east coast of the United States until it reaches Cape Hatteras, where it spreads out and merges into the *North Atlantic Drift* which, under the influence of the westerly variables, flows north-eastward towards the shores of North-West Europe. Some of the waters of the North Atlantic Drift are deflected south off the coast of the Iberian Peninsula and flow along the north-west coast of Africa as the cool *Canaries Current*, which ultimately merges into the North Equatorial Current.

The waters passing into the Arctic Ocean from the North-West Atlantic cannot go on accumulating there indefinitely, and cold currents flow along both sides of Greenland southward into the Atlantic. That known as the *Labrador Current*, which flows between Greenland and Baffin Land, is partly responsible for the severe winters of the St. Lawrence Region and the freezing up of the approaches to that estuary. As the Labrador Current flows southward its cold, dense waters sink beneath those of the Gulf Stream.

The mixing of warm moist air over the Gulf Stream with the cold air over the Labrador Current is responsible for the frequent fogs in

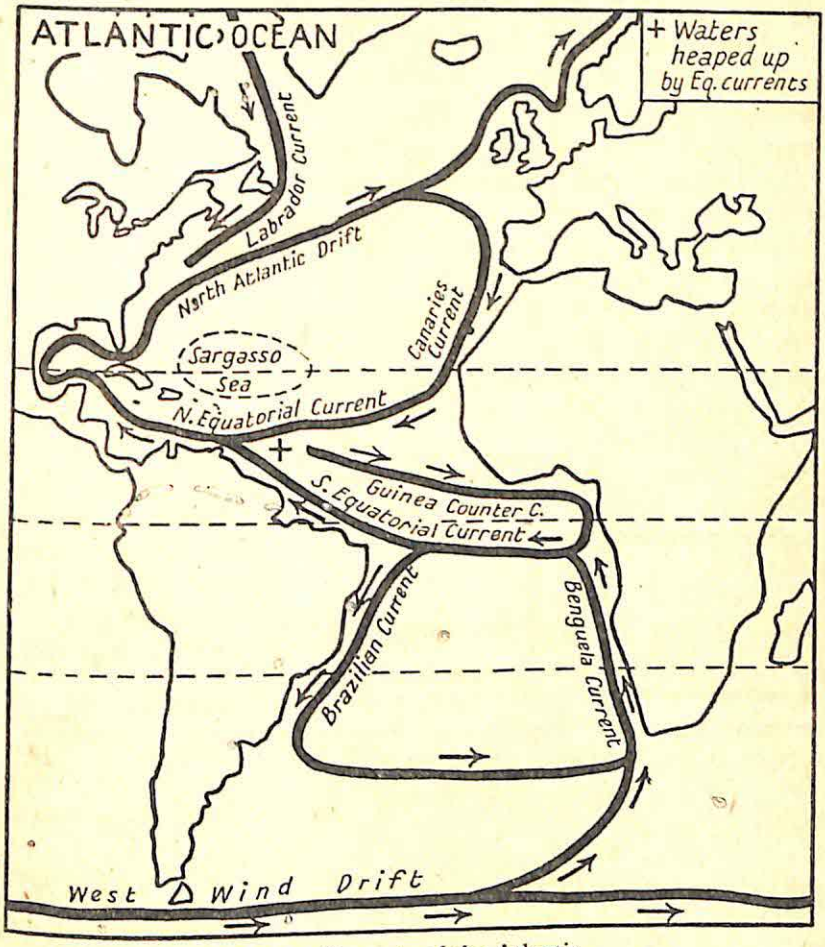


FIG. 25. Currents of the Atlantic.

the neighbourhood of the Grand Banks of Newfoundland and at the mouth of the St. Lawrence. The icebergs brought down by the Labrador Current are a menace to shipping. In the south-west of the North Atlantic a great area of comparatively calm water, surrounded by swirling currents and drifts, forms the *Sargasso Sea*, where vast quantities of floating seaweed are continually collecting.

Currents of the Pacific. In the Pacific, under the influence of the trade winds, the *North Equatorial* and a *South Equatorial Current* flow westward from the shores of the Americas towards Asia and Australia. Between them, a counter current, the *Equatorial Counter Current*, due to the piling up of waters in the west, flows eastward towards the Americas. The North Equatorial Current, on

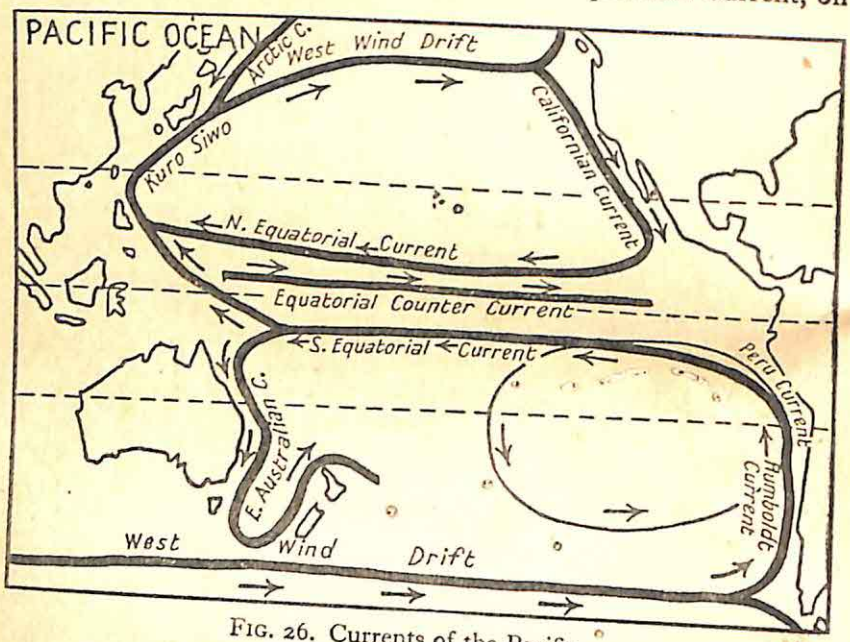


FIG. 26. Currents of the Pacific.

reaching the East Indies, turns north and flows along the east coast of Asia as the warm *Kuro Siwo*, or *Japan Current*. Off the east coast of Japan, it is driven by the westerly winds eastward towards North America, where the greater part turns south, passing along the west coast of the continent as the cool *Californian Current*, which finally merges into the North Equatorial Current. The South Equatorial Current, on reaching Australia, divides into two. The more northerly branch flows north-west to join the North Equatorial Current. The southerly branch passes along the east of Australia and Tasmania as the warm *East Australian Current* whence, under the influence of the brave west winds, it flows east and circulates on both sides of New Zealand. The brave west winds drive the *West Wind Drift*

eastward across the Southern Pacific. A portion of this drift turns north on reaching the west coast of South America, and runs along the coast of Chile as the cold *Humboldt Current*, which off the coast of Peru (*Peru Current*) merges into the South Equatorial Current.

Currents of the Indian Ocean. In the south of the Indian Ocean the circulation resembles that of the South Pacific. A *South*

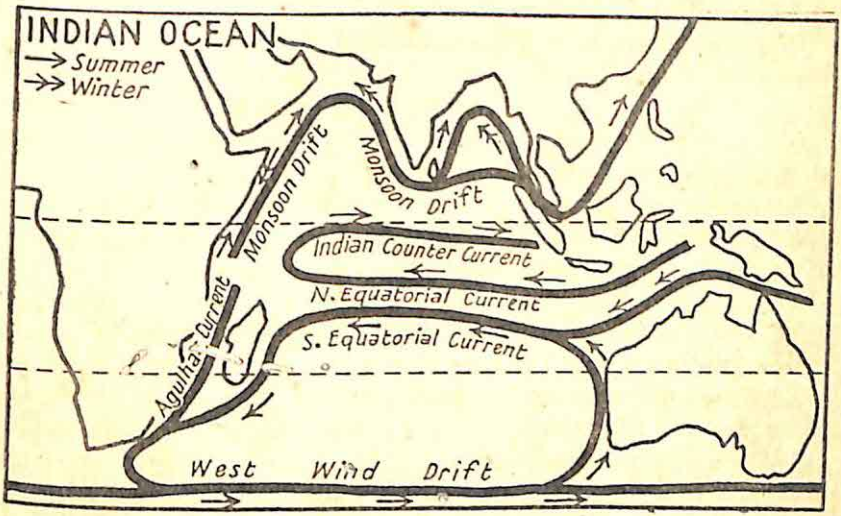


FIG. 27. Currents of the Indian Ocean.

Equatorial Current, turns south off Madagascar and, as the *Agulhas Current*, passes along the south-east coast of South Africa. It then flows east and merges into the *West Wind Drift*. Part of this current, the cold *West Australia Current*, on reaching Australia, turns north.

In the north of the Indian Ocean the currents depend on the direction of the monsoon winds. In summer the south-west monsoon winds drive the waters of the *Monsoon Drift* in a clockwise direction around the Arabian Sea and the Bay of Bengal, whence they pass through the Strait of Malacca into the Pacific, reinforcing the *Kuro Siwo*. In winter, under the influence of the North-East Monsoon, the currents are reversed. They now flow in a counter-clockwise direction around the Bay of Bengal and the Arabian Sea, where the *Monsoon Drift*, on reaching the west coast of Africa, flows south, joins the *Mozambique Current* passing between Madagascar and the mainland, and then merges into the *Agulhas Current*.

TIDES

Every one who visits the sea is familiar with the tides. Twice a day the water rises: twice a day it recedes. Thus there is a space of some 12 hours (actually, on an average, 12 hours 25 minutes) between each high, or flood tide, and the same interval between each low, or ebb tide.

Tides are caused by the gravitational attraction—the 'pull'—of the moon on the earth, sometimes assisted by, and sometimes hindered by the sun. But, owing to the fact that the moon is so much nearer to the earth than the sun, its tide-raising effect is more than twice as great (the ratio is about 9 : 4) as that of the sun.

The liquid covering of the earth is much more affected than the solid portion. The water on the side of the earth nearest the moon is heaped up into a great wave, with a corresponding wave on the opposite side. Thus on each side of the earth there is heaped up a tidal wave, while midway between these waves are troughs of low water. Since the earth rotates from west to east, these bulges, or tidal waves, travel round the earth from east to west.

At new and full moon, when the sun, moon, and earth are practically in a straight line (Fig. 28 A), the attractive force of the sun increases that of the moon, thus causing tides that are higher and lower than the average. Such tides are called spring tides, and they occur, of course, twice in a lunar month.

When the moon is in its first and third quarters, the attractive force of the moon is exerted at right-angles to that of the sun and, as the two bodies are now opposed to each other, the tide-raising effect of the moon is lessened (Fig. 28 B). When this happens the high tides are not so high; the low tides do not recede so far, and there is less difference between high and low water. Such lesser tides are called neap tides. (How often do they occur?) The actual conditions described above are, of course, modified to some extent by the uneven distribution of land and water on the earth's surface.

In the open ocean the tides are not a striking phenomenon. From trough to trough the tidal wave measures several thousand miles, but from trough to crest the height is only a few feet. The water moves up and down, but the rise or fall is limited to 2 or 3 feet.

Very different are the conditions when the tidal wave approaches the continental shelf. For example, when the Atlantic tidal wave

approaches the British Isles, it passes suddenly into the shallow waters covering the continental shelf, and its advance is checked. The crest of the wave, travelling over slightly deeper water, moves at a somewhat greater rate, and tends to overtake the preceding

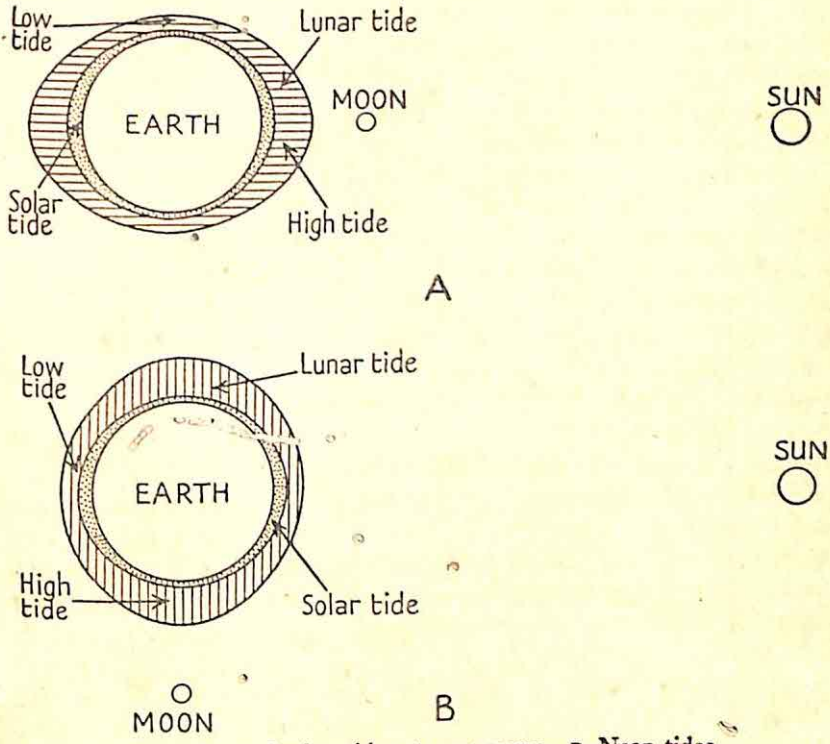


FIG. 28. A. Spring tides at new moon. B. Neap tides.

trough. Thus the height of the wave is increased and its shape is changed. From the above it will be seen that in shallow seas, open to the effects of the ocean, there is a much greater difference between high and low tide than in the open ocean.

The tidal wave approaches the British Isles from the south-west. One branch on reaching the west coast of Ireland divides into two portions. One flows round the north of the island and enters the Irish Sea through the North Channel, the other flows round the south of Ireland and flows into the Irish Sea through St. George's Channel. Another branch rounds the north coast of Scotland, and

a part, passing through the Pentland Firth, flows south along the east coast of Britain. It brings high water later and later to each succeeding port, and reaches the mouth of the Thames about twelve hours from the Pentland Firth. A third branch flows up the

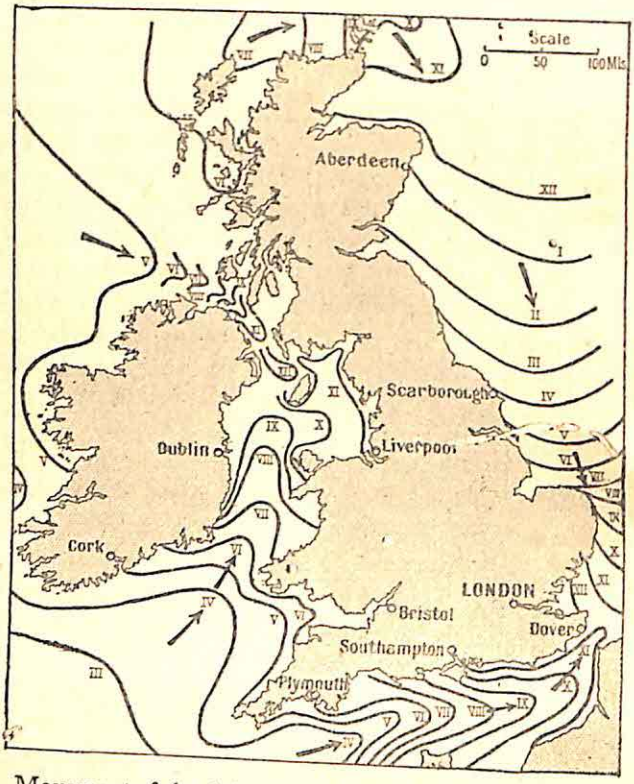


FIG. 29. Movement of the Atlantic tidal wave round the shores of Britain.

English Channel, entering the North Sea through the Straits of Dover. Fig. 29 makes it clear that Dover and Liverpool have high water about the same time.

Southampton has double tides, high water through Spithead being two hours later than that through the Solent. Formerly this phenomena was thought to be due to the Isle of Wight, which caused the tidal wave to divide. But recent research shows that the second tide results from a backwash of the tidal wave from the coast of France.

In funnel-shaped estuaries, such as the Severn or the Bay of

Fundy, the tidal wave passing up a rapidly narrowing opening has to accommodate itself to a smaller and smaller area, with the result that its amplitude steadily increases. In the Bay of Fundy the tidal range, or the difference between high and low water is, during spring tides, sometimes as much as 70 feet, while in the Severn estuary it reaches some 40 feet. 'In some instances this action is so marked as to produce a crest-fronted wave, known as the *bore* on the Severn and as the *eagre* on the Trent.' These waves attain a height of 3 or 4 feet, but the bore on the Yangtze-Kiang is as great as 12 feet high. In bottle-shaped estuaries, such as the Mersey, Portsmouth Harbour, and the Tagus, conditions are reversed, the tidal range is less than in funnel-shaped estuaries, and the strong currents passing through the narrow neck tend to scour the channel and keep it deep. The flood tide, by deepening estuaries, is advantageous to shipping for (*a*) it makes it possible for vessels to travel farther up the estuary than would otherwise be the case, and (*b*) strong currents, by helping to keep channels free from silt, prevent deltas being built up, or sediment deposited.

In almost enclosed seas, like the Mediterranean, the tidal range is not more than 2 or 3 feet. Hence there are few strong currents to keep the mouth of the rivers free from silt, and, as we have seen, deltas are formed. Thus in the Mediterranean no important ports are actually situated on the rivers, though a number, like Marseilles, stand at the entrance to valleys which form channels of communication.

EXERCISES

1. The surface salinity of the ocean in the Equatorial Belt is 34 per thousand, around the Tropics of Cancer and Capricorn 36 per thousand, off Labrador 32 per thousand; while in the Baltic it is as low as 8 per thousand, and in the Dead Sea as high as 225 per thousand. Account for these differences.

2. Describe briefly the cause of tides. Illustrate your answer by diagrams.

3. What are the chief causes of ocean currents? Draw a sketch-map showing the chief currents of the Pacific Ocean.

4. Describe the general direction of the principal currents of the N. and S. Atlantic Ocean, showing the relation of the currents to the prevailing winds.

5. (*a*) Illustrating your answer from the North Atlantic, state how the height of tides in the open ocean differs from their height on the continental shelf. (*b*) Illustrating your answer by sketch-maps, explain the exceptional nature of the tides of (i) *either* the Severn *or* the Bay of Fundy, (ii) Southampton Water. (*c*) How may tides and tidal currents affect human activities?

6. What is the *continental shelf*? Discuss its practical importance illustrating your answer from the seas round the British Isles.

CHAPTER VI

WEATHER AND CLIMATE

Weather may be defined as the condition of the atmosphere at any place at a particular time. The average weather conditions determine the *climate*. Humidity, temperature, elevation, distance from the sea, ocean currents, atmospheric pressure, and prevailing winds combine to affect the climate of a region.

HUMIDITY

Evaporation is the means by which water is drawn off, as invisible water vapour, from oceans, seas, lakes, rivers, and other exposed moist surfaces. Warm air can contain more moisture than cool air. *Humidity*, the term used to express the dampness of the atmosphere, is due to the presence of water vapour. When the air contains as much water vapour as it can hold it is said to be *saturated*. When saturated air is cooled *condensation* takes place, and some of the water vapour becomes visible as clouds, &c. The proportion of water vapour in the air, compared with the maximum it can hold at the same temperature, is known as the *Relative Humidity*. In equatorial regions it is not so much the high temperature which causes discomfort to white people as the high relative humidity.

Formation of Dew and Hoar Frost. Dew is caused by the condensation of water vapour on the cold ground during the night. Some of this moisture is obtained from the air itself, but the greater part rises into the air through blades of grass and from the roots of plants. The temperature at which such condensation takes place is called the *Dew Point*. When this occurs below freezing-point, then hoar frost is formed instead of dew.

Clouds, Fog, Mist, and Snow. The air contains tiny particles of dust around which the water vapour condenses as minute drops of liquid water. When condensation takes place at some distance from the ground, clouds are formed. If it takes place near the surface the result is usually *mist* or *fog*. The layer-like clouds often seen on the horizon at sunrise and sunset are called *stratus* clouds. The light wispy *cirrus* clouds, formed high in the sky, are due to low temperatures which cause condensation to take place in the form of ice

crystals. The heaped up clouds, looking rather like masses of cotton wool, called *cumulus*, are caused by currents of rising air. The black rain clouds are known as *nimbus*. When water vapour is condensed at a temperature below freezing point it forms snow.

Rain. As the minute drops of water which form the clouds grow

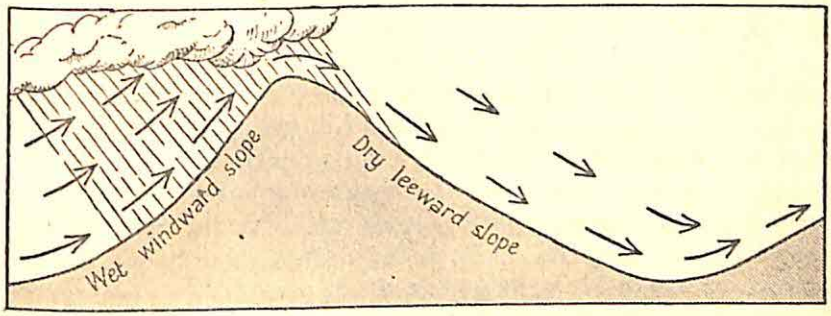


FIG. 30. Relief rains.

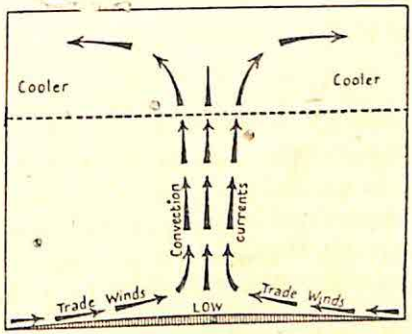


FIG. 31. Convectional rains.

larger they fall to the earth as rain. Rainfall is caused by the cooling of saturated air.

(1) When winds blow from warmer to cooler latitudes they tend to cause rain.

(2) When moisture-laden winds are forced up to a higher level by mountains they rise into regions of less pressure, and on expanding lose much of their heat. As a result of this cooling the moisture in them is condensed, falling on the windward side of the mountains as rain. Such rains are known as *Relief Rains* (Fig. 30). On descending

the opposite side of the mountains, the winds, which have lost much of their moisture, tend to become still drier, for, as they contract and are warmed in their descent, they absorb rather than deposit moisture. The leeward side of such mountains is said to lie in their *Rain Shadow.*

(3) In equatorial regions, ascending air currents, rising into cooler regions, cause *Convectional Rains* (see p. 447) (Fig. 31).

(4) Heavy rains accompany cyclones (see p. 59).

Rainfall is measured by a rain gauge which records the amount in inches. When we say an inch of rain has fallen, we mean that if none had been lost, and if the ground were quite flat, the latter would be covered with water to a depth of 1 inch.[1] To obtain a rainfall record, the monthly or yearly amounts are noted over a period of years, and the results added together and divided by the number of months or years during which records have been taken. Note that 1 foot of snow is equivalent to 1 inch of rain. The annual rainfall varies, of course, in different regions. Its value to plant life depends on latitude, but even more important than the total amount is its seasonal distribution.

TEMPERATURE

Of all climatic factors temperature is the most important. Deficient rainfall can, under favourable circumstances, be remedied by irrigation. Except on a small scale, the effect of great extremes of heat and cold cannot be overcome. Temperature affects man's food, crops, dress, and the type of dwelling he builds.

Temperature is measured by a thermometer. There are various kinds, but the one usually used in the British Isles is that with the Fahrenheit scale. In this scale, the freezing-point of water is 32° and boiling-point is 212°. To keep a temperature record, the maximum and minimum temperatures are added together, and the total divided by 2: the figures thus obtained give the mean temperature. If the mean temperatures for every day in the month are added together, and the result divided by the number of days in the month, the mean monthly temperature is obtained.

How the earth's surface is heated. When the surface of the earth is warmed, the air nearest the ground is heated by contact, and this heat is passed on to the layers above, partly by conduction and

[1] 1 inch of rain = 100 tons of water (approximately) per acre.

partly by convection. In a similar way, when the ground is cold, the effect passes from the lower layers of the air upwards. Pure dry air allows the sun's rays to pass through it with little loss of heat; but the presence of clouds, water vapour, dust, and carbon-dioxide causes loss of heat during their passage through the atmosphere.

The earth's surface is warmed by the rays of the sun. The more directly the sun's rays shine down upon the surface, the less portion

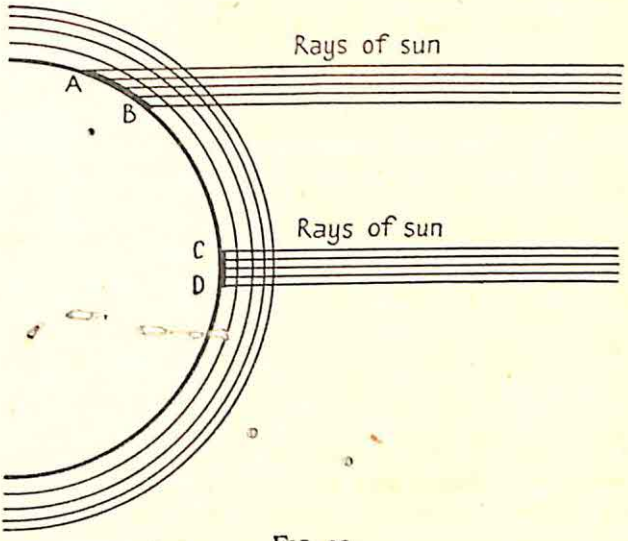


FIG. 32.

of this surface have they to heat, and the greater their warming power. When the rays are slanting they spread out over a greater portion of the surface: thus each part receives less heat than if it were under the direct vertical rays. The sun is always more or less overhead in the zone that lies around the Equator, upon which its rays always shine down more or less directly. The farther one travels towards the polar regions, the less direct are the solar rays, and the less powerful is the heat they give. In higher latitudes, too, the rays have to pass through a thicker layer of the atmosphere, thus losing more heat than they do when travelling through thinner layers in lower latitudes. Fig. 32 shows two equal bundles of solar rays. Note that they have a smaller portion of the earth's surface to heat at *CD*, a region in the tropics, than at *AB*, nearer the poles, where

their heat is less concentrated because spread over a larger area. The temperature of a place depends mainly on latitude, but partly on elevation.

Influence of Altitude on Temperature. Temperature decreases 1 degree for every 300 feet above sea-level. This decrease is largely due to the fact that the rarefied air, found in elevated regions, absorbs less heat than the denser air at lower levels.

An interesting phenomenon, known as *inversion of temperature*, is sometimes experienced in mountain regions, where at times the temperature is less in the valleys than at greater heights. In winter when the weather is clear and calm, the cold heavy air, on account of its weight, flows down the mountain sides to the bottoms of narrow valleys, which thus become increasingly cold. At night the effect is increased, for owing to radiation, the layers of air near the ground become colder and so the air does not rise and mingle with the lighter layers above. But as soon as calm is succeeded by windy weather, the different layers of air mix and normal temperature conditions follow. This inversion of temperature accounts, in part, for the fact that in mountain regions villages are usually situated on the slopes of the hills, especially those slopes facing south (in the Northern Hemisphere), rather than on the valley floors.

The Influence of the Ocean on Temperature. Land heats more quickly than water, and also loses heat much more rapidly. Consequently, though the waters of the ocean take longer to heat than the land, they do not lose their heat nearly so quickly and are not subject to such rapid changes of temperature. In summer the winds from the ocean are cool, but in winter they are relatively warm. Hence in the temperate zones, the interiors of continents, lying as they do far from the sea, have hot summers and very cold winters. Such a type of climate is known as a *Continental Climate*. On the other hand, islands and continental margins where the prevailing winds blow on-shore, have a *Maritime* or *Insular Climate*. In summer cool winds blowing from the sea temper the heat, in winter warm winds from the ocean moderate the cold.

The effect of Ocean Currents on Temperature. Ocean currents, by warming or cooling the winds blowing over them, affect the temperatures of adjacent lands. The warm North Atlantic Drift raises the winter temperatures of North-West Europe, especially those of the British Isles and Norway, forming a winter Gulf of Warmth.

Prevailing Winds. We have already seen (*a*) that the chief cause of wind is difference in atmospheric pressure; (*b*) that winds blow from regions of high pressure to those of low pressure; and (*c*) that there are well-marked prevailing winds in different regions of the world. Such winds have a close relation to both rainfall and temperature. In the British Isles, for example, the prevailing south-west winds, blowing from the Atlantic Ocean, (*a*) cause heavy rain in the mountainous west, and (*b*) render the temperature more equable by (i) reducing it in summer, and (ii) raising it in winter. In Northern Chile, the prevailing south-east trade winds blow off-shore, or parallel to the coast, throughout the year, with the result that this part of the country forms the rainless Atacama Desert.

ISOTHERMS

Isotherms (Greek *isos* = equal, *thermos* = heat) *are lines, drawn on a map, joining places of equal temperature, such temperatures being first of all reduced to sea-level.* Such reduction is, of course, made for the purpose of comparison. Isothermal maps are easy to memorize, but it is necessary to remember that, except in the case of a place situated at sea-level, they do not show the actual temperature. The latter is obtained by subtracting from the temperature, as shown by the isotherm passing through the place, 1 degree for every 300 feet of height.

Example. On an isothermal map of Canada, Calgary (3,389 feet) lies almost on the July isotherm 70° F.

July temperature at Calgary (to nearest degree)

$$= 70 - \frac{3,389}{300}$$

$$= 70 - 11$$

$$= 59° \text{ F.}$$

In most atlases the isothermal maps show the January and July temperatures, because these months are usually those with the greatest extremes of temperature and, moreover, may be taken as typical of the winter and summer conditions.

On some maps actual temperatures are shown by appropriate colouring or shading.

Temperature Maps of the World. A number of outstanding facts about the January and July Temperature Maps of the world

should be noted. We must remember, however, that while January is a winter month in the Northern Hemisphere, it is a summer one in the Southern Hemisphere (Figs. 33 and 34).

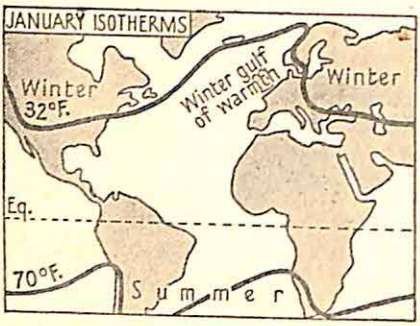


FIG. 33. Note the northward bend of the January isotherm 32° F. In the southern hemisphere the 70° F. (summer) isotherm bends polewards over the land, but towards the Equator over the sea.

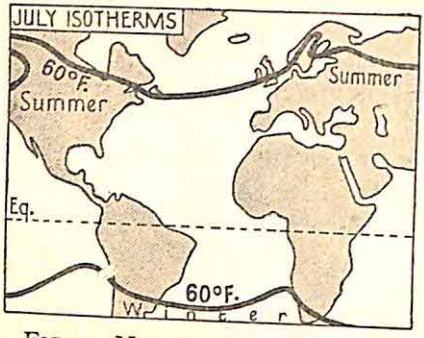


FIG. 34. Note how the July isotherm, 60° F., in the northern hemisphere bends towards the North Pole. In the southern hemisphere, where it is winter, this isotherm bends north over the sea, but south over the land.

(1) In winter, the isotherms bend towards the Equator over the land and towards the Poles over the sea. Why? Because the land is cooler than the sea in the same latitudes.

(2) In summer, the isotherms bend towards the Equator over the sea and towards the Poles over the land. This is because the land heats much more rapidly than the sea in similar latitudes. At this season the interiors of the continents are warmer than the coastal regions.

(3) Note the effect of ocean currents on temperatures. The North Atlantic drift, as we have seen, raises the temperature of North-West Europe. The cold Peru current, flowing northward along the west coast of Chile and Southern Peru, reduces the temperatures of these regions.

ISOBARS, CYCLONES, AND ANTICYCLONES

Just as isotherms are drawn on maps joining places of equal temperature, so *isobars* (*baros* = weight, pressure) *are drawn joining places of equal atmospheric pressure.* When the pressure gradient between two sets of isobars is steep, i.e. where the isobars are close together, then the winds blow with great force from the direction of the higher to the lower isobar.

In addition to the permanent and semi-permanent world pressure systems, there are less permanent and smaller low- and high-pressure systems. These are known as cyclones and anticyclones. Such systems have a great effect on British weather, as we know from reading the Daily Weather Reports in the papers, or from hearing them broadcast.

A *cyclone* (*depression*) *is a portion of the atmosphere in which the pressure is lowest in the centre. The winds blow inwards in the opposite direction to the hands of a clock.* As will be seen by Fig. 35 the winds blow from the south or south-west in the front of the cyclone, and from the north or north-east in its rear. When a cyclone is approaching the barometer falls because of the low pressure, but the thermometer rises on account of the warm south or south-west winds in the front of the system. The rising moisture-laden air of such a cyclone causes rain which is especially heavy in the centre of the depression. If, after a day or night of storm and rain, the barometer rises and the thermometer falls, we know that the cyclone is passing, for (*a*) the pressure is now increasing, and (*b*) the cold north or north-east winds in the back of the depression cause the temperature to become lower.

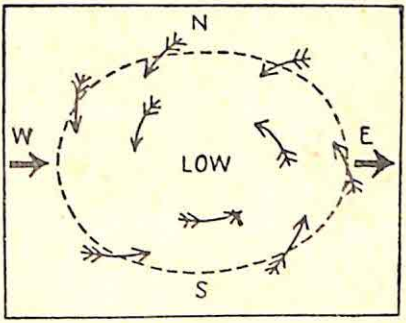


FIG. 35. Direction of winds in a cyclone (Northern Hemisphere).

[In the Southern Hemisphere cyclonic winds blow in a clockwise direction in accordance with Ferrel's Law.]

A *Secondary* often occurs on the edge of a big depression, moving round it in an anti-clockwise direction. Such secondaries are also low-pressure areas. They are much smaller in extent than cyclones, but like them are usually accompanied by stormy weather.

A cyclone in temperate regions is generally several hundreds or even thousands of miles across. But in tropical regions there are small depressions (usually called Tropical Cyclones) which may measure only 50 or 100 miles across. As the pressure gradients are steep, the winds are exceptionally strong, and the resulting storms often do great damage. In the West Indies such storms are called

hurricanes, in the South-East United States they are called *tornadoes*, and in the West Pacific and China Seas *typhoons*, while the whirling dust-laden storms of the Sahara, of similar type, are termed *simooms*.

An anticyclone is a portion of the atmosphere in which the pressure is highest in the centre. The winds, which are usually light, *blow spirally outwards* (in the Northern Hemisphere) *in the same direction as the hands of a clock* (see Fig. 36). As the air is warmed in descending it tends to gather moisture rather than deposit it, and so the weather associated with anticyclones is usually fine and dry. As anticyclones tend to remain stationary, until displaced by cyclones, the fine weather experienced during such periods usually lasts for a considerable time. In summer the days are warm and the skies clear with little cloud. In the British Isles, during winter, the days during a spell of anticyclonic weather are cold and bright, the nights frosty and starlit. In low-lying regions, however, the cold heavy air becomes laden with moisture from the damp ground and thus fogs tend to form which, owing to the absence of strong winds, often last for several days.

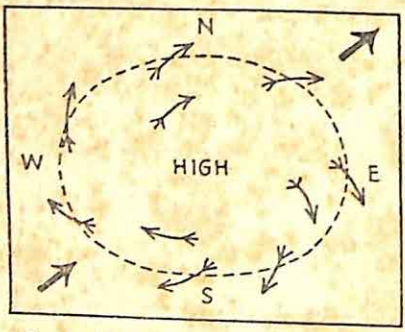
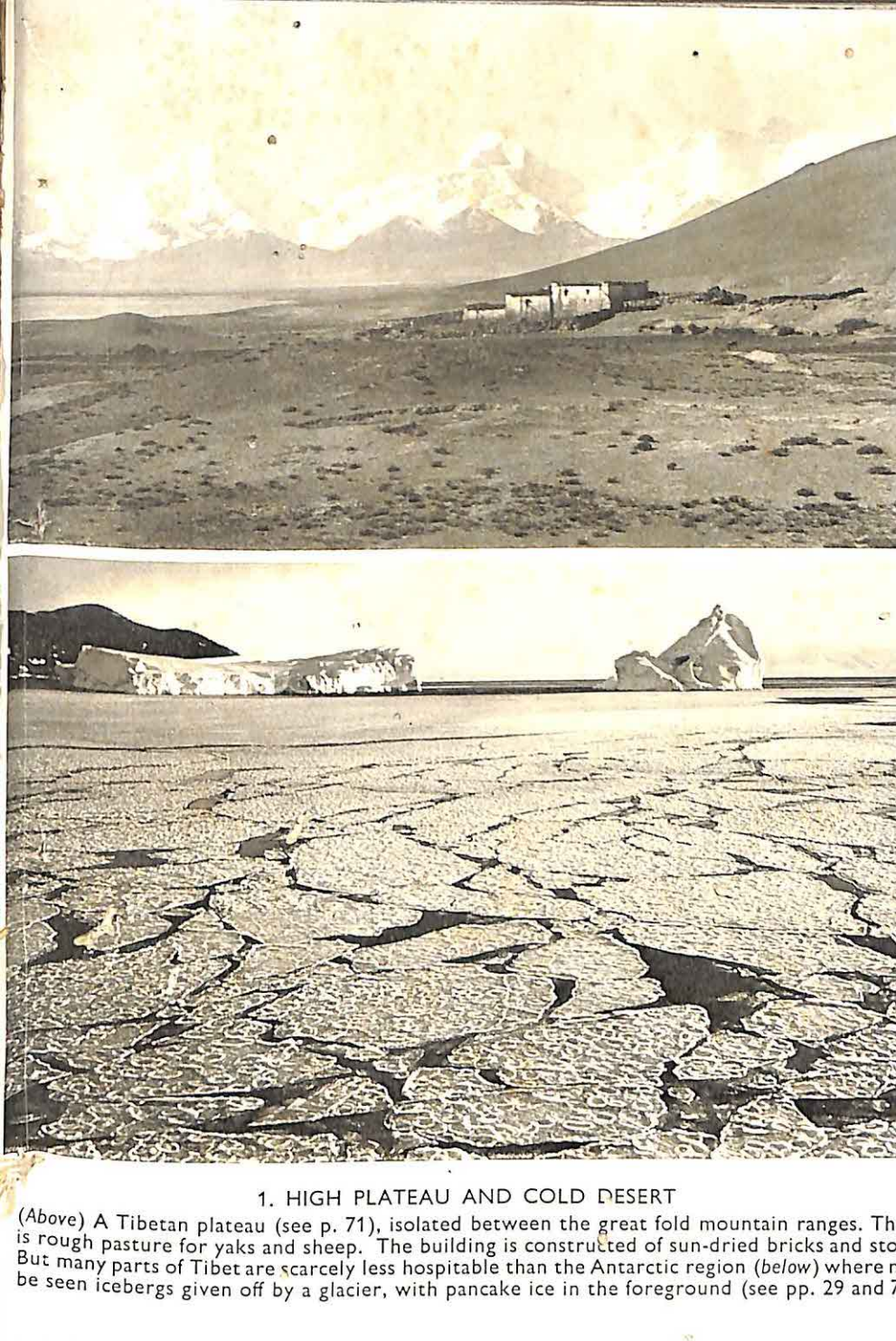


FIG. 36. Directions of winds in an anticyclone (Northern Hemisphere).

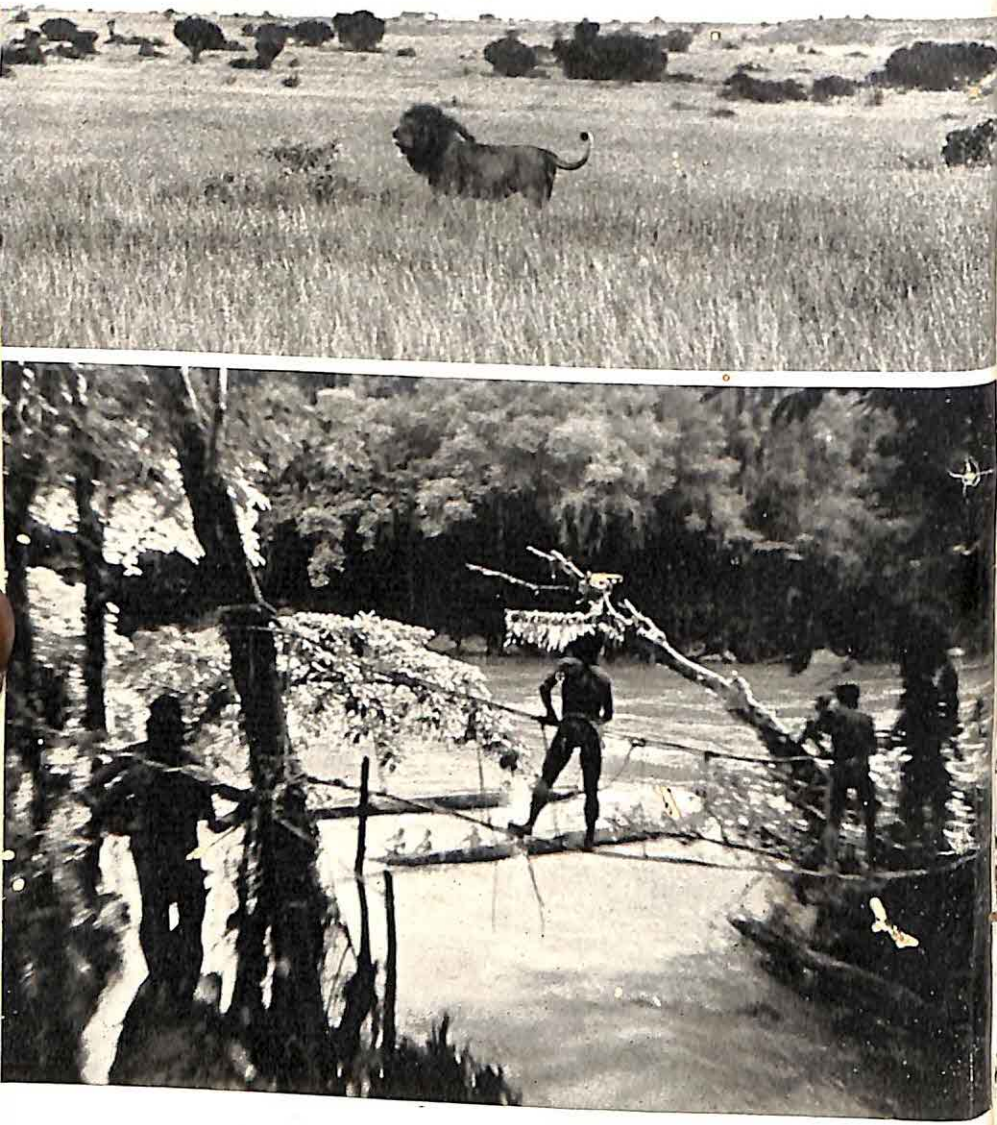
LOCAL WINDS

In different parts of the world local winds, due to a variety of causes, often have a considerable effect on climatic conditions, notably on temperature. One of the best known of such winds is the *föhn* of the Alps, a warm dry wind which blows chiefly in the valleys to the north of the main chains, especially in those of the upper Rhine, the Reuss, and the upper Aar. As currents of air ascend the mountains they pass into an area of lower pressure with the result that they expand, and being cooled deposit most of their moisture as rain or snow on the windward side of the ranges. The dry air passes over the mountain crests and on descending the leeward side is heated by compression: temperatures rise quickly and the snow melts with great rapidity. In spring the *föhn* sweeps the snow from



1. HIGH PLATEAU AND COLD DESERT

(*Above*) A Tibetan plateau (see p. 71), isolated between the great fold mountain ranges. Th
is rough pasture for yaks and sheep. The building is constructed of sun-dried bricks and sto
But many parts of Tibet are scarcely less hospitable than the Antarctic region (*below*) where n
be seen icebergs given off by a glacier, with pancake ice in the foreground (see pp. 29 and 7

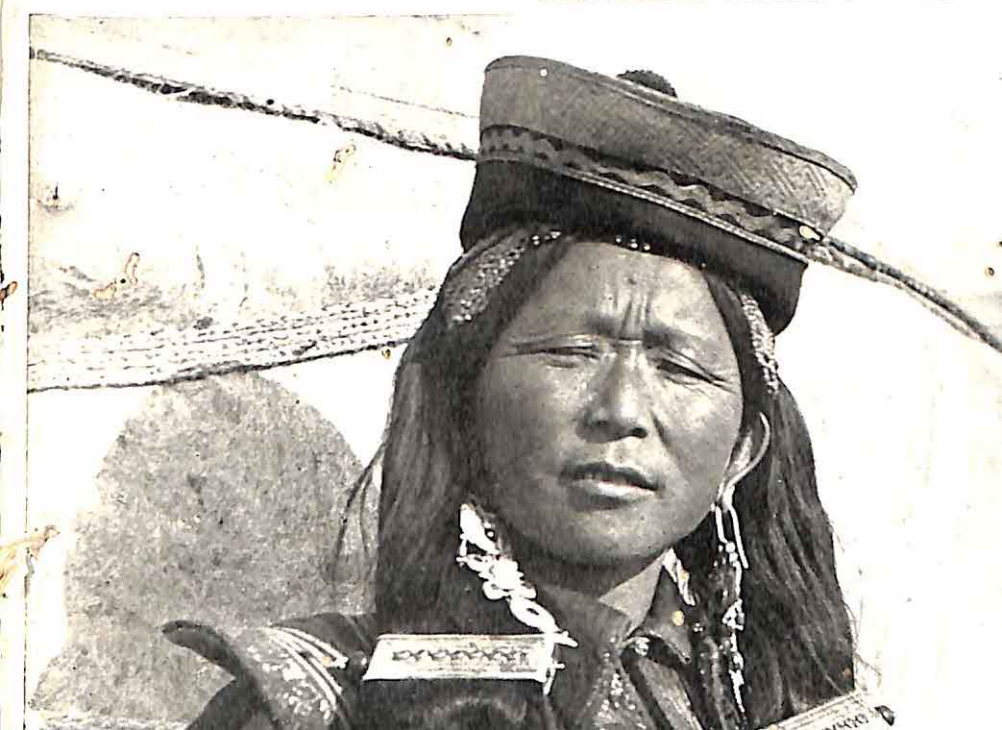


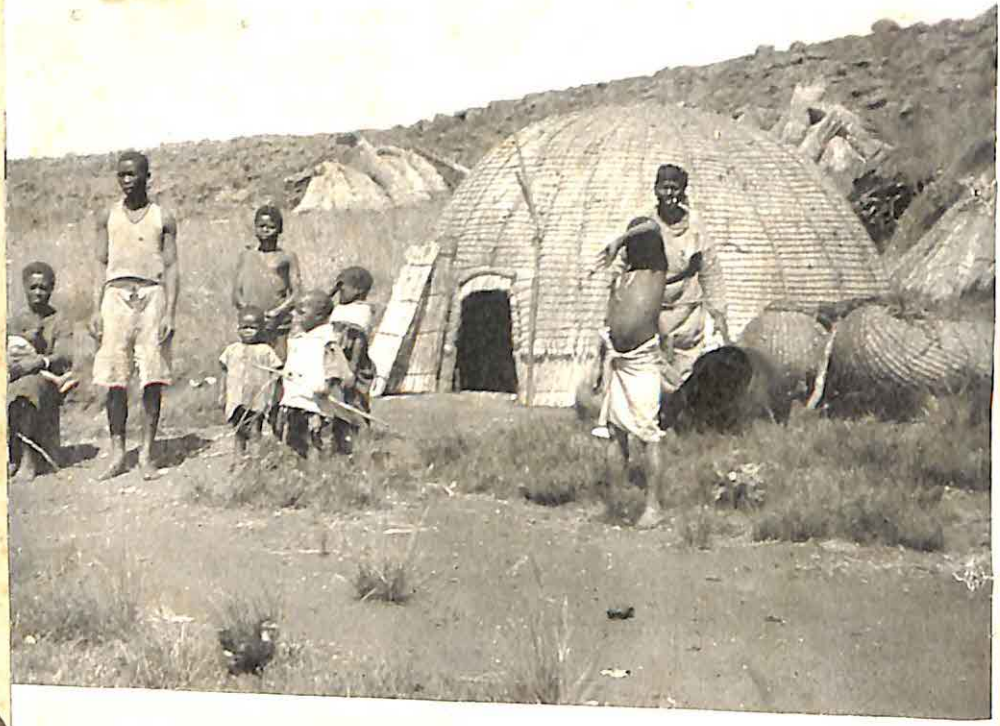
2. SAVANNAS AND TROPICAL FORESTS

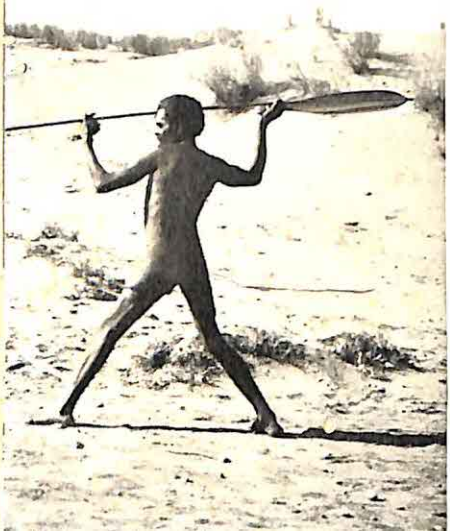
the savannas (*above*) the trees grow singly or in clumps. The uniform colouring of the lion nds equally well with the brown grasses and the rocks and sands of the desert into which savannas merge. (Photograph by M. L. Lippens). The tropical monsoon forests of South-t Asia (*below*) are more open than the equatorial forests. Dyaks, the aboriginal inhabitants Borneo, whose villages lie close to the rivers, may be seen crossing a stream on a bridge made of plaited lianas

3. CONTRASTS IN ASIA

(*Above*) A Hindu—descendant of the Indo-Aryans from Central Asia who invaded India about 1500 B.C. He carries the trident of Siva (see p. 273). (*Below*) A Mongolian woman whose broad, flat face, high cheek-bones, almond-shaped eyes, and long, straight, black hair are typical of her race.







4. BANTUS AND ABORIGINES

(*Above*) A Bantu family in Zululand, a reserve in Northern Natal, outside their hut in the kraal. The hut is built of pliable branches fixed in the ground, interlaced with other branches, and completed by thatching. (*Below*) One of the Australian aborigines preparing to throw his spear. These stone-age inhabitants of Central Australia depend mainly on hunting, for they grow no plants and have no domesticated animal except the dog. The prevailing vegetation consists of mulga-trees and porcupine grass.

the alpine pastures, making them available for cattle and goats sooner than would otherwise be the case; in summer it hastens the ripening of the grain, and in autumn of the grapes. The *chinook*, a similar hot drying wind, descends from the Rockies to the valleys and plains lying to the east. It turns the standing grass into hay, and in winter, by keeping the grazing grounds near the foothills relatively free from snow, enables stock to be grazed out of doors, whereas farther east the animals must be housed at this season, for the prairies are covered with snow.

The *harmattan* is a very dry and dust-laden east or north-east wind which, especially from October to February, blows from the Sahara to the Sudan. Sometimes in January and February its effect is felt along the coast of the Gulf of Guinea where, owing to its dryness, it provides welcome relief from the usual steamy heat and is known as 'the doctor'. The *sirocco*, a hot dry south wind blowing from the Sahara to the Mediterranean, is most unpleasant. Men and animals both suffer, and often its scorching breath does great injury to vegetation and crops. In Egypt this wind is called the *khamsin*. The *mistral* and the *bora* are cold north winter winds. The former sweeps down the Rhone valley and across the Mediterranean coast from the mouth of the Ebro to Genoa. In the lower Rhone valley the peasants protect their gardens from this violent wind by planting thick cypress hedges, and build their houses so that the windows and doors face south-east. The Dalmatian coast of the Adriatic suffers in a similar way from the *bora*, which is drawn southward towards the low-pressure area over the sea.

CLIMATIC TYPES

A. Tropical Lands.

1. The *Equatorial Type* has heavy rain throughout the year, and uniformly high temperatures.
2. The *Summer Rain Type* is found on both sides of the Equatorial Wet Belt. It has marked wet ('Summer') and dry seasons, and temperatures are high.
3. The *Monsoon Type* is similar to the Summer Rain Type. Heavy rains fall during the summer monsoon, but the cool season, and the hot season preceding the monsoon rains, are dry.
4. The *High Plateau Type* is a modification of the Equatorial Type

due to altitude. Temperatures, though lower, are uniform, and the rainfall is less than in the lowlands.

5. The *Hot Desert Type*, as its name implies, receives little rain. It is found in the High Pressure Belts around the Tropics of Cancer and Capricorn, where the Trade Winds blowing towards the Low Pressure Region about the Equator tend to absorb rather than deposit moisture.

B. Warm Temperate Lands.

1. The *Warm Eastern Margins* of the continents have hot rainy summers and dry cold winters.
2. The *Mediterranean Type* is found on the western margins of the continents, between latitudes 30° and 40°. The summers are hot, dry, and sunny, the winters mild and showery.
3. The *Interior Lowlands* have a continental climate, with hot summers, cool winters, and low rainfall.
4. The *Plateau Type* of climate resembles that of the Interior Lowlands (B. 3), except that the summers are not quite so hot and the winters somewhat cooler.

C. Cool Temperate Lands.

1. The *Eastern Margins* of the Cool Temperate Lands have warm summers, cold winters, and rain throughout the year, but most in summer.
2. The *Interior Lowlands* have a continental climate with hot summers, cold winters, and a light rainfall with a spring maximum.
3. The *Western Margins* of the continents have an insular climate. The summers are cool, the winters mild, and rain falls at all seasons.
4. The *Mountain Type*. Temperatures are reduced through elevation. The windward slopes have a heavy rainfall, but the sheltered valleys and intermont plateaus are dry. There is a marked *Rain Shadow* on the leeward slopes of the mountains.

D. Cold Lands.

1. The *Tundra* have an extreme climate. The winters are very cold, the summers are cool (slightly under 50° F.), and the rainfall scanty (under 8 inches). The ground is permanently frozen a few feet below the surface.
2. The *Cold Deserts* are always covered with ice and snow.

EXERCISES

1. Describe how the earth's surface is heated. Give a diagram.

2. Write notes on relief rains, the formation of dew, rain shadow, isobars, and relative humidity.

3. What is an isotherm? Trace and account for the course of one isotherm round the world.

4. Under the headings given, summarize the characteristic features of (*a*) a cyclone, and (*b*) an anticyclone. (i) Pressure, (ii) State of barometer, (iii) Direction of winds, (iv) Typical weather.

5. Describe and account for the weather sequence which you would expect in Central Scotland after it had been broadcast that a deep depression off western Ireland was moving rapidly eastward.

6. The centre of a cyclone moves over Donegal, Glasgow, and Inverness. (*a*) Draw a map to show the weather conditions when the centre is over Donegal. (*b*) Describe the direction of the winds and the kind of weather you would expect when the depression is travelling over (i) Glasgow, and (ii) Inverness. (*Note. Make a tracing of your map* (*a*) *above, on transparent paper. Before answering* (*b*) *place your tracing so that the centre of the depression is* (i) *over Glasgow, and* (ii) *over Inverness.*)

7. What are the characteristic features and local importance of the following winds: (*a*) Föhn, (*b*) Mistral, (*c*) Harmattan, (*d*) Simooms, and (*e*) Typhoons?

8. How do you account for the following: (*a*) in mountainous regions the temperature is sometimes lower in the valleys than at greater heights; (*b*) in the British Isles in winter there is sometimes thick fog for several days in the valleys, while during the daytime the hills are frequently bathed in sunlight?

CHAPTER VII

MAJOR NATURAL REGIONS OF THE WORLD

We may divide the world into a number of major natural regions whose physical features, rock structure, soils, climate, and resultant products and human activities are similar over large areas. Of all the factors affecting the natural vegetation in such regions, climate is the chief, and of the climatic factors, temperature and rainfall are the most important. The vegetation depends not only on the total annual rainfall, but on its relation to temperature, and on its distribution. In short, evaporation and the seasonal distribution of the rainfall are the real test. In high latitudes evaporation is less than in low latitudes, and hence less rainfall is needed to keep the subsoil moist than in tropical regions.

As a rule no sharp contrast can be drawn between adjacent natural regions: the transition from one to the other is gradual. Plant and animal life is adapted to its surroundings. Man, too, has adjusted himself to his environment, though in many cases the appearance and habits of people living in similar natural regions differ greatly. In some, Man counts for little more than the animals: in others, such as Europe and China, he has profoundly altered the surface features. Natural regions would, of course, exist whether Man were there or not, but no study of them can be considered complete without some knowledge of the activities of their human inhabitants.

An examination of the effect of climate on human life shows that very high and very low temperatures both prevent the fullest attainment of mental and physical powers, and even in less extreme regions uniformity of temperature exercises an adverse effect on development. High humidity, combined with high temperature, produces an enervating climate. Man's progress has been greatest in cool temperate lands where the climate is cool enough to invigorate, but not cold enough at any season to retard economic life.

We may divide the major Natural Regions of the world into four groups. The following regions in each group are numbered to correspond with the coloured map at the end of this book.

A. TROPICAL LANDS.

1. Equatorial Type.
2. Summer Rain or Savanna Type.
3. Tropical Monsoon Type.
4. High Plateau Type.
5. Hot Desert or Sahara Type.

B. WARM TEMPERATE LANDS.

1. Warm Eastern Margins or China Type.
2. Mediterranean Type.
3. Interior Lowlands (Warm) Type.
4. Iran Plateau Type.
5. High Plateau Type.

C. COOL TEMPERATE LANDS.

1. Eastern Margins of Cool Temperate Lands.
2. Interior Lowlands. Cool Forest Type.
3. Interior Lowlands. Cool Grassland Type.
4. Western Margins of Cool Temperate Lands.
5. Mountain Type.

D. COLD LANDS.

1. Tundra Type.
2. Cold Desert Type.

THE TROPICAL LANDS

A. 1. **The Equatorial Type.** In the equatorial belt the sun's altitude is never less than 66½°; its rays shine down more or less directly throughout the year; and temperatures are uniformly high. There are convectional rains at all seasons, but they are especially heavy at the equinoxes (Fig. 37). Most rain falls in thunder showers that occur every afternoon, i.e. in the hottest part of the day. The greater part of the Amazon and Congo basins is clad with tropical forest. From a dense undergrowth trees spring up in tiers. The struggle is not for moisture, but for light and air, and so close together are the forest giants that they are unbranched except at the top. Trees include logwood, mahogany, coco-nut and oil palms.

Malaya and the East Indies form a subdivision of this region,

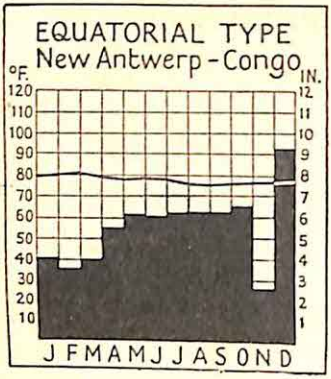


FIG. 37. (A. 1.)

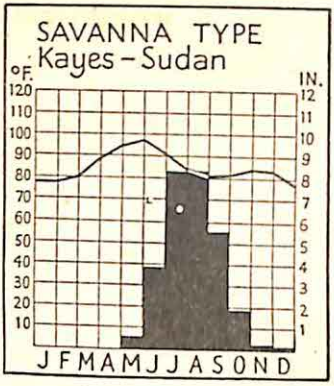


FIG. 38. (A. 2.)

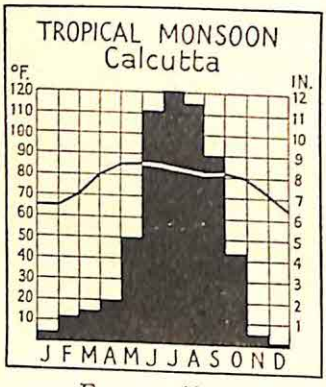


FIG. 39. (A. 3.)

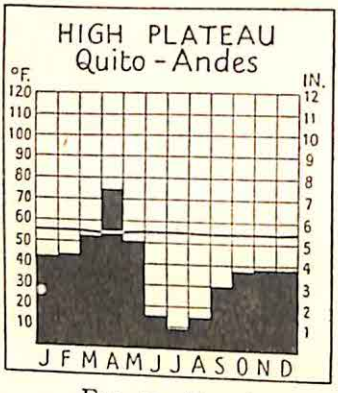


FIG. 40. (A. 4.)

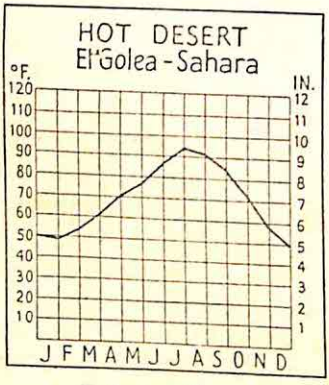


FIG. 41. (A. 5.)

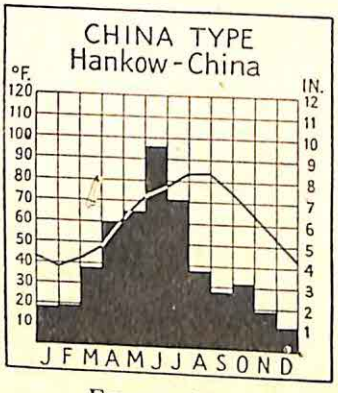


FIG. 42. (B. 1.)

Natural Regions of the World. Monthly temperatures and rainfall.

though, owing to their maritime position, their forests are less dense than those of the Amazon.

In the more open tropical forests animals like the tigers of the monsoon lands and the leopards and the elephants of Asia and Africa are found. In the denser areas, owing to difficulty of movement, many animals, such as the gorillas of West Africa, are tree-dwellers; while others, like the crocodiles and rhinoceroses of the Old World, live in or by the rivers.

A. 2. **The Summer Rain or Savanna Type.** The tropical grasslands, or savannas, are found on both sides of the equatorial forests. Temperatures are uniformly high, rain falls during the summer months, but the cool season is dry (Fig. 38). Soon after the rains begin the grass commences to grow rapidly, springing up in clumps, usually from 6 to 12 feet high. Trees, which stand singly or in groups, are of the drought-resisting variety, such as acacias, baobabs, and eucalypts (Australia), for they must be able to withstand the dry season. In Africa the northern savannas are known as the *Sudan*. The savannas of the Orinoco basin are termed *llanos*, and those of the Brazilian Highlands, *campos*. Savannas are also found in the drier parts of India, in the higher regions of the East Indies, and in the north and east of Australia. Among the chief crops are cotton, sugar-cane, maize, coffee (Brazil), and, in drier areas, millet and ground-nuts.

The African savannas are the home of such ungulates, or hoofed animals, as antelopes, giraffes, buffaloes, zebras, and elephants; and carnivores like lions, hyenas, and leopards. The ostrich, too, is found in this region, while in Australia the emu is a savanna bird. Stock-rearing is important.

A. 3. **The Tropical Monsoon Type** is especially well marked in India, and it is also found in Indo-China, Southern China, and Northern Australia. The monsoons are due to the development of low-pressure areas over the land during summer, when inflowing winds bring heavy rains; and to high-pressure areas over it in winter, which is a dry season, as winds blow from land to sea (Fig. 39). In areas where the rainfall is over 80 inches the dense forests are somewhat similar to those of equatorial regions. The typical, and more open, monsoon forest, with teak, baobabs, and other deciduous trees which shed their leaves in the dry season, is found in regions where the annual rainfall is between 40 and 80 inches. 'Such forests

are perhaps less rich in natural resources than the hot rain forests, but they are healthier and more easily cultivated and more favourable to human settlement.'[1] In the wetter regions the crops include rice, tea, and jute. In areas where the rainy season lasts from six to seven months cotton and sugar-cane can be cultivated. In drier districts millet is the chief cereal crop.

Among the monsoon animals are elephants, lions, tigers, leopards, and various types of monkeys.

A. 4. **The High Plateau Type.** In this modification of the equatorial type, heat is tempered by altitude. Temperatures are remarkably uniform though much lower than those of the lowlands. The rainfall is less than in the lowland areas and tends to be seasonal (Fig. 40). The best example of this type is found on the Plateaus of Ecuador and Colombia, in South America, where the climate has been described, somewhat optimistically, as 'perpetual spring'. Crops such as barley and wheat, grown for local needs, ripen with difficulty. Stock-rearing is the chief occupation. On the East African Plateau—a tropical plateau of moderate elevation—savannas are found at lower elevations, while temperate crops can be grown in higher areas.

A. 5. **The Hot Desert or Sahara Type.** From the high-pressure belts, about 30° N. and 30° S., the trade winds blow towards the low-pressure belt round the Equator. As they are flowing from cooler to warmer regions they become warmer as they proceed, and tend to absorb rather than deposit moisture. Thus they are dry winds (Fig. 41). For this reason, a desert belt is found around the tropics, on the *western sides* of the continents. In North Africa, owing to the presence of a great land mass to the east, the Sahara extends right across the continent, and the desert belt of which it forms a part is continued into Arabia, and thence across Central Asia. In the west of the United States the desert and arid area about the Tropic of Cancer includes the Colorado, Mohave, and Gila Deserts. The chief deserts of the Southern Hemisphere are the Atacama of South America, the Kalahari of South Africa, and the Great Australian Desert.

Desert soil only requires irrigation to make it fertile. Sometimes the water is obtained from underground supplies, as in the typical oasis. In other cases it is got from rivers like the Nile, the Indus, or the Colorado. The presence of minerals has induced man to settle

[1] *A Junior Plant Geography*, M. E. Hardy (Clarendon Press).

in such regions as (i) Western Australia, e.g. Kalgoorlie, for gold; (ii) the Western Mountain States of the United States, for various minerals; and (iii) the Atacama Desert, to obtain nitrates and copper. In spite of the building of railways across, or to the margins of desert areas, and of motor transport, the camel is still an important beast of burden, for it can carry heavy loads. Its padded feet, specially adapted to traversing sandy areas, prevent it from sinking into the sand; its hump enables it to store up reserve supplies of food, and the cellular apparatus in its stomach, of water, while it can close its nostrils during sand-storms. In Africa the lands bordering the desert and the savannas are the home of the lion, whose tawny coat enables it to blend with the sands and the parched savanna scrub and grasses.

WARM TEMPERATE LANDS

B. 1. **The Warm Eastern Margins or China Type.** The chief climatic characteristics of this region are hot rainy summers and dry cold winters (Fig. 42). Central and Northern China are typical areas, but others belonging to it are Japan and the South-East United States in the Northern Hemisphere; Natal and the east of the Cape Province in South Africa; New South Wales, Southern Queensland, and South-East Brazil in the Southern Hemisphere. It should, however, be noted that (*a*) Japan and North and Central China receive monsoon rains, and (*b*) the eastern marginal lands of the Southern Hemisphere have a milder climate than their northern counterparts. High summer temperatures and heavy rains favour evergreen forests, with walnut trees and shrubs like laurel and camellia. Cultivated plants include rice, cane sugar, cotton, tobacco, coffee, and tea. The Sino-Japanese—the Temperate Monsoon—Region is one of the most densely peopled areas in the world.

B. 2. **The Mediterranean Type** reaches its greatest extension around the Mediterranean Sea. Outside this region it is limited to *west coast lands between latitudes* 32° and 38°, such as Central California, Central Chile, the south-west of South Africa, and South-West Australia. During winter the Mediterranean lands lie in the path of the on-shore, rain-bringing Westerlies; in summer they are in the track of the trades, which blow off shore, or parallel to the coast (Fig. 43). The vegetation is adapted to withstand the summer drought, and both trees and shrubs are mainly evergreens.

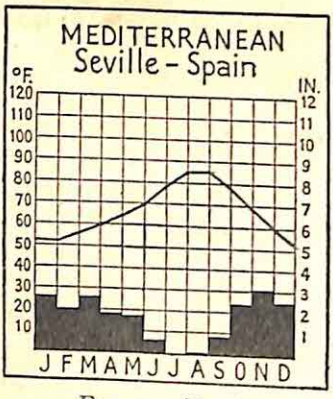


FIG. 43. (B. 2.)

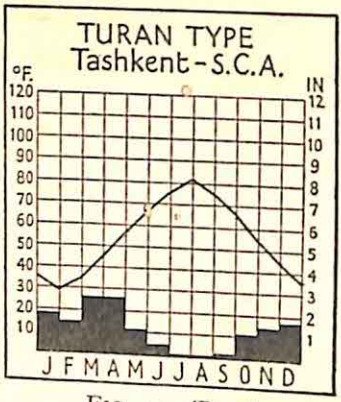


FIG. 44. (B. 3.)

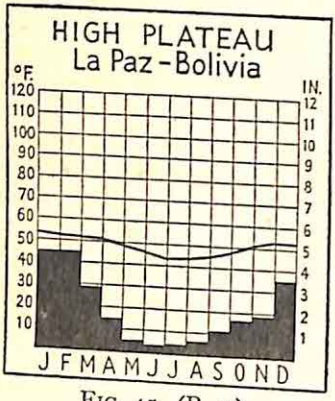


FIG. 45. (B. 5.)

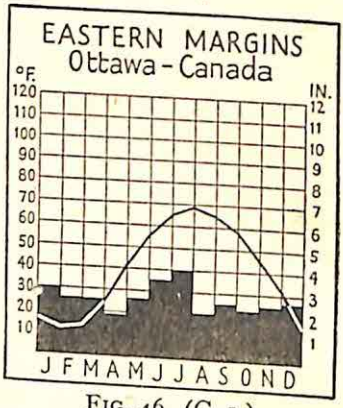


FIG. 46. (C. 1.)

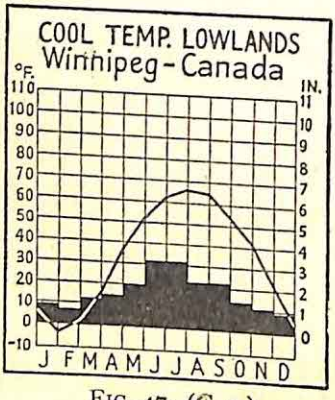


FIG. 47. (C. 3.)

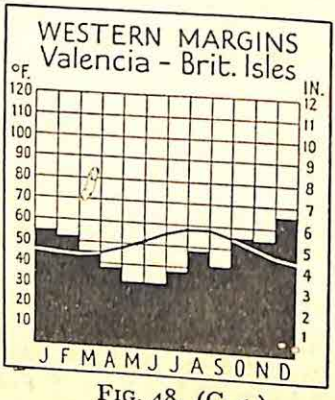


FIG. 48. (C. 4.)

Natural Regions of the World. Monthly temperatures and rainfall.

Deciduous trees are found only in better-watered areas, and there is an absence of pasture for cattle. Cereals, such as wheat and barley; the olive and the vine; and warm temperate and citrus fruits (oranges, lemons, and grapefruits), are widely cultivated.

B. 3. **The Interior Lowlands (Warm) Type.** This region is also known as the *Turan Type*, as it reaches its greatest extension in the lowland of Turan, which stretches from the Caspian eastward towards the Pamirs, and from the northern edge of the Plateau of Iran northward, beyond the Sea of Aral, to the Kirghiz steppes. The climate is continental, with hot summers, cool winters, and a low rainfall (Fig. 44). In the southern part of the United States the area extends from the Rockies eastward to 100° W. In South America the west of the pampas, and in Australia much of the Murray basin, may be included in this region.

The natural vegetation is grassland as, except in favoured districts, there is insufficient rainfall for trees. In Turan nomadic herdsmen pasture their flocks on the steppes in spring, but migrate to the lower slopes of the mountains in summer. Stock-rearing is important, especially in the 'newer' countries. Where the annual rainfall exceeds 12 inches, wheat and other cereals can be grown: specially favoured areas in this respect are the pampas and the Murray basin. Fruit is cultivated on irrigated lands, like the Riverina district in the Murray basin, and that round Mendoza and other centres lying amidst the Andean foothills. Much fruit is also grown in Turan, where cotton, too, is an important crop.

B. 4. **The Iran Plateau Type.** Plateaus of moderate elevation, like the Plateaus of Iran and Asia Minor, and the Tarim Basin, have a climate resembling that of the Interior Lowlands, except that the summers are not quite so hot, and the winters are cooler. Outside Asia we may include in this type the plateaus lying between the main chain of the Rockies and the Sierra Nevada; parts of the Mexican Plateau, and the Veld of South Africa. The natural vegetation is grassland. Stock-rearing is the chief occupation.

B. 5. **The High Plateau or Tibet Type.** Owing to its great elevation (12,000 to 14,000 feet), and to the isolating effect of mountain barriers, Tibet has an extreme climate with very cold winters. Some agriculture is carried on in sheltered valleys, but the people are mainly pastoral, breeding sheep, goats, and yaks for food, wool, and transport purposes. The Plateau of Bolivia, as it lies nearer the

Equator and not so far from the ocean as Tibet, has a less extreme climate (Fig. 45). Hardy cereals and potatoes are the chief crops. The dwarf camels, known as alpacas, vicuñas, and llamas, are raised for meat and wool. The sure-footed llama, which can carry loads of 100 pounds, and can go for four or five days with little food and no water, is the chief transport animal.

THE COOL TEMPERATE LANDS

C. 1. **The Eastern Margins of the Cool Temperate Lands** have a more extreme climate than the western ones. In the Northern Hemisphere they include Eastern Canada, Manchukuo (Manchuria), Northern China, Northern Japan, and Chosen (Korea). In the Southern Hemisphere we may include Patagonia in this region. The prevailing winds are off-shore. Thus they have a moderate to light rainfall and are hot in summer and cold in winter (Fig. 46). Though cyclonic storms bring rain, the annual amount is less than in the western marginal lands. In winter rivers are frozen, and the more northerly ports ice-bound for some months. The natural vegetation consists mainly of coniferous and deciduous forests. In cleared areas mixed, dairy, and fruit farming are important.

The Cool Temperate Interior Lowlands are found in Canada and Siberia, whence they extend into European Russia. They have a continental climate. The rainfall varies from moderate to light, diminishing towards the west in Siberia and the east in Canada. Most rain falls in summer (Fig. 47). In winter the snow helps to protect the ground, and in spring it softens it and adds to its moisture content. We may divide these Interior Lowlands into the **Cool Forests** and the **Cool Temperate Grasslands.**

C. 2. **The Cool Forests** form a wooded girdle round the land mass of the Northern Hemisphere. Though the rainfall is low, yet, thanks to the small evaporation, it is sufficient to keep the subsoil moist enough for pines and similar evergreen trees. Forests cannot grow where the summer temperature is less than 50° F., and thus the dividing line between the woodland belt and the tundra to the north is determined by summer temperature. Lumbering, mining, and trapping are important. In Russia, despite great strides that have been made in recent years, the felling of timber has not yet attained an importance comparable with that of Canada and Sweden.

C. 3. **The Cool Temperate Grasslands.** Though in the steppes

of Russia and the prairies of Canada the moisture is insufficient for trees, it is ample for grasses. The drier parts are stock-rearing areas, but the regions with a somewhat greater rainfall are devoted to the large-scale cultivation of cereals. In Canada the cultivated zone is beginning to invade the forest belt, and the efforts of the agricultural scientists 'are directed to the breeding of varieties of wheat which will ripen in the short, intense summers with their long days'.[1] Rye, oats, and barley are the crops best suited to the marginal region.

C. 4. **The Western Margins of the Cool Temperate Lands,** exposed to the on-shore westerly winds, have an insular climate, with cool summers, mild winters, and rain throughout the year, especially in autumn and winter (Fig. 48). British Columbia, North-West Europe, Southern Chile, Tasmania, and most of New Zealand lie within this region. The natural vegetation consists of coniferous and deciduous forests and grasslands. Much land has been cleared for cultivation. Temperate cereals and fruits, roots like potatoes and sugar-beet are widely cultivated. Dairying and stock-rearing are important.

C. 5. **The Mountain Type.** In cool temperate latitudes there are extensive lofty mountain belts in the interiors of Asia and North America. In the former continent they comprise the North-East Highlands: in the latter they form the northern portion of the Western Mountain System. The rainfall is heaviest on the northern slopes in Siberia and on the western slopes in Canada. The leeward sides of the mountains and the interior valleys are dry. Lumbering and mining are the chief occupations.

THE COLD LANDS

D. 1. **The Tundra,** or polar lowlands, are found in the extreme north of Eurasia and North America. In the latter continent they are aptly known as the Barren Lands. For two-thirds of the year the tundra are buried in snow, and rivers and lakes are frozen to a great depth. In May temperatures begin to rise and the greenish gloomy night is succeeded by continuous daylight, during which time the sun does not sink below the horizon for several months. The melting snow exposes the mosses, lichens, and low berry-bearing bushes, and soon the ground is covered with innumerable flowers. Birds and animals, too, respond to the miracle of spring.

[1] *Handbook of Canada.*

Enormous flocks of snow-geese, eider ducks, cranes, and ptarmigan darken the air as they fly northward to nest; and herds of reindeer leave their winter quarters on the margins of the forest and travel towards the ocean. In the Old World the reindeer are domesticated: in North America they are still wild, though domesticated herds have been introduced into Alaska and Northern Canada. Towards the end of August the thermometer begins to fall, and in less than a month winter again reigns over these vast expanses, almost unexplored and unmapped by Man.

D. 2. **The Cold Deserts** stretching round the Poles are always covered with ice and snow. The outstanding climatic features are low temperatures and the length of the summer days and winter nights. The continent of Antarctica, around the South Pole, consists for the most part of a high plateau buried beneath an Ice Sheet of unknown thickness. The pack-ice often stretches for hundreds of miles from the coast, though the extent varies from year to year. Greenland, and the higher parts of the Arctic archipelago, are also of this type.

EXERCISES

1. What do you mean by a Natural Region? What are the chief factors affecting the development of such regions? In what region, or regions, has Man's progress been greatest, and why?

2. Into what major Natural Regions would you divide the Temperate Zone? Describe the climate and natural vegetation of *one* of these regions and show how the latter is adapted to climatic conditions.

3. Describe the climatic conditions and natural vegetation of the Equatorial Forest Belt. What are the chief differences between this region and the Monsoon Forests, and how do these differences affect the cultivation of typical products?

4. Draw a map of *one* continent and divide it into major Natural Regions. Select *one* region and describe its climate, vegetation, and animals.

5. In what parts of the world are the following animals used for transport and allied purposes: the reindeer, camel, yak, llama, and elephant? Show how any *three* of these animals are adapted to their environment, and state the kind of work each performs.

CHAPTER VIII

THE PEOPLES OF THE WORLD

The Primary Races. Mankind is usually divided into three *primary* races: (1) the *Caucasian*, popularly termed the White Race; (2) the *Mongolian*, or Yellow Race; (3) the *Negro*, or Black Race.

The map (Fig. 49) shows that the Caucasians are found mainly in Europe, North Africa, and South-West Asia. The rest of Asia is occupied chiefly by Mongolian peoples. The Americas are the home of the 'Red' Indians.[1] Most of the negroes live in Africa, south of the Sudan, but there are a large number in the South-East of the United States and the West Indies, as well as in some parts of Tropical South America. The majority are the descendants of freed slaves brought from Africa to work in the plantations.

There is much intermixture of race, especially in marginal areas. The primary divisions are based on the colour of the skin, which is due to variable pigments. But colour alone is not an entirely reliable guide. Most of the people of Europe are Caucasians, but whereas the Norwegian has a fair skin and fair hair, and is usually blue-eyed, the Italian has an olive skin, dark hair, and dark eyes. Negroes vary from a light chocolate hue to almost coal black. Both the Japanese and the Bushmen of the Kalahari are yellow in colour, but they belong to different races.

Actually the texture of the hair provides a surer test of race. Hence terms based on the hair should be linked with the more popular names based on colour. The hair of the Caucasian is oval in cross-section, and is wavy. That of the Mongolian is round in cross-section, and is long and straight, hanging loose like a piece of string. The Negroes have woolly hair arranged in small interlocked spirals, and if a section of such a hair were examined under a microscope it would be seen that it was flattened in cross-section.

There are, of course, other physical characteristics associated with the different races. Mongolian people, such as the Chinese and Japanese, have broad flat faces with high cheek-bones, almond-shaped eyes, and are of rather short stature.

[1] The 'Red' Indians of America are now regarded by most authorities as a branch of the Mongolian Race.

The Negroes as a rule are tall. They have thick lips and broad, flat noses. Their original home was in Africa, south of the Sahara, where the bulk of them live to-day. The Sudanese Negroes who, as their name implies, live in the Sudan, are very dark brown in colour. The Bantu Negroes, who form the majority of the inhabitants of Africa south of the Sudan, are lighter in colour than the Sudanese, and their noses are often less flat and broad. The Pygmies, who inhabit the depths of the Congo forests, do not exceed 4½ feet in height. Though the Bushmen and Hottentots of the Kalahari Desert are yellow-skinned their hair is woolly like that of the Negroes. In the West Indies, Negroes—descendants of freed slaves—form the bulk of the population, while in the United States there are nearly 12 million Negroes, most of whom live in the south-east.

The people of Malaya, the Papuans of New Guinea, and the Polynesians and Melanesians living in the islands of the South-West Pacific vary in colour from light brown to dark black. The aborigines of Australia, a primitive race now few in number, are dark-skinned and have shaggy hair.

At the dawn of history Europe seems to have been inhabited by three branches of the Caucasian Race. (i) Around the Mediterranean lived a short, slender, dark-haired, and dark-complexioned people with very long heads. They had probably come from Africa at the time when the two continents were joined by land across the Strait of Gibraltar, and from Tunis to Sicily. These folk are now known as the *Mediterranean Race*. (ii) At a later date other peoples entered Europe from Asia. They travelled westward, following the setting sun, and settled in the upland regions—the Alps, the Central Plateau of France, and the Pyrenees. These people, who had brown hair, fairly dark complexions, and round heads, were somewhat taller than the Mediterranean Race, and as they inhabited the uplands they are now called the *Alpine Race*. (iii) Most of the people who live in Northern Europe belong to the *Nordic Race*: they are tall, with fair hair, blue or grey eyes, and have long heads.

The present peoples of Europe are a mixture of these and some other stocks, but in few regions do we find pure racial strains. The Europeans have expanded overseas, where their descendants compose the greater part of the inhabitants of North America and Australia. In the Union of South Africa about one-third of the total population is of European descent, while the bulk of the remainder are Bantus of

negro origin. There are a large number of people of European—mainly Mediterranean—stock in South and Central America, though in these regions a still greater number are of mixed European and Indian blood.

The Negro is often described as lazy, but competent authorities, who have made a lifelong study of the question, say that though less efficient than the European in activities that secure success in modern

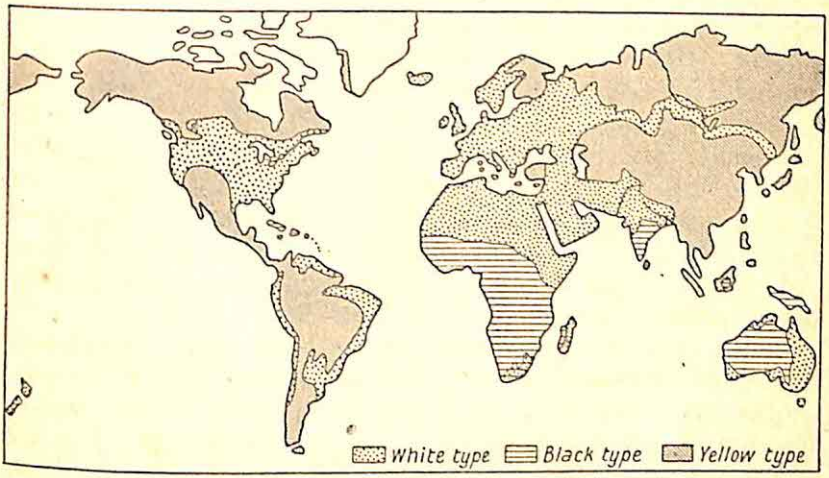


FIG. 49. Distribution of Primary Races.

life, yet in his natural environment he is a painstaking worker and delights in manual labour. Good-tempered and affectionate the Negro undoubtedly is, and blessed with a strong sense of humour.

The Mongolian is an artistic craftsman and a great organizer. In countries like China he has been one of the pioneers of those large-scale irrigation works essential to enable the land to support an enormous agricultural population.

The European, including his descendants overseas, displays a genius for large-scale co-operation. 'He is possibly no more inventive than the Chinese, but he is unrivalled in the common sense and insight with which his inventions are applied in practice and developed on a great scale. Modern industrialism is due to his instinct for co-operation—all the great instruments of its progress, such as the steam engine, electric power, the internal combustion engine,

and metallurgy, require the co-operation of experts in many branches of science, of great industrial organizers, and men of business.'[1]

Simple Occupations. The racial stock from which they spring, the kind of region in which they live, and their past history all unite to form the background of a people. It is mainly in the temperate lands that Man has attained his highest development. The North Temperate Zone has been the home of all the greatest civilizations of ancient and modern times—Egyptian, Babylonian, Persian, Hindu, Chinese, Minoan (Cretan), Phoenician, Greek, Roman; and at a later date, European, which has spread throughout the temperate lands of the Americas, Africa, and Australia.

Outside these temperate regions, with their invigorating climate, Man has lagged behind. During the last four centuries contact with Europeans has played a great part in the development of native peoples, but in many parts of the world even to-day are tribes living under primitive conditions. A few, like some of those inhabiting the depths of the Amazon forests or the Australian aborigines, are mainly collectors, living on fruits, nuts, berries, and birds' eggs. Others, such as the Eskimos of the cold lands, are chiefly hunters and fishers. On the drier parts of the Asiatic steppes, and also on the savannas, live nomadic tribes who depend almost entirely on their flocks and have no settled homes. But others more advanced are agriculturists, tilling their plots of land, and living in semi-permanent villages. Some of these folk are skilled craftsmen, smelting iron and forging weapons and simple agricultural implements: others weave and some fashion pottery. All these simple occupations represent stages in Man's development, and are in essentials closely allied to more advanced occupations such as large-scale agriculture, mining, modern manufacturing, engineering; and to transport, on which all branches of modern industry depend.

Distribution of Population. The relief of the land, the kinds of rocks, and above all the climate that so greatly influences the vegetation, all affect the occupations of the people and their distribution. In countries like the British Isles the industrial districts are much more densely peopled than the agricultural areas, while mountainous regions, like the Scottish Highlands, have but few inhabitants.

[1] *Race as a Political Factor*, Professor Gregory.

The most populous regions in the world are (*a*) the industrial areas of Europe and the United States, and (*b*) the monsoon lands of Asia.

The Industrial Revolution—the Machine Age—which began in Britain towards the middle of the eighteenth century, established the factory system, and from that time the great coal-fields of Britain, and later those of France, Belgium, and Germany, became increasingly important centres of production and dense population. To-day these and other coal-mining districts in Europe, together with those

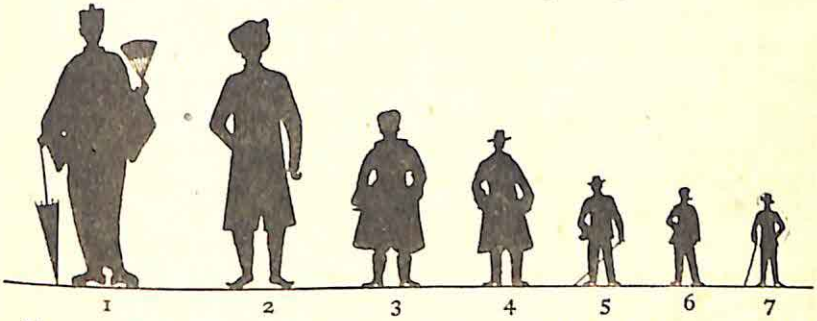


FIG. 50. Comparative populations of some of the most densely peopled countries. 1. China. 2. India. 3. Russia. 4. U.S.A. 5. Germany. 6. British Isles. 7. France.

in the Eastern United States, are thickly populated areas whose people, living in large and closely linked towns and cities, are engaged mainly in manufacturing pursuits. In the Pennsylvanian industrial area the presence of coal and petroleum, together with accessible supplies of hydro-electric power, has further stimulated economic development.

In the present century the use of electricity has played a great part in establishing many varied industries outside the coal-mining areas. Thus in Britain, both Greater London and the surrounding counties have in recent years become one great industrial district whose factories depend, in large measure, on electricity for their power. The inhabitants do not, however, live in such congested conditions as those in the older manufacturing areas, for outside London itself the factories are more widely spread, and adequate transport is available to convey the workers to and from their homes.

Modern industrial nations, like Britain, Germany, and the United States, thanks to their supplies of coal, electricity, and (in the case of

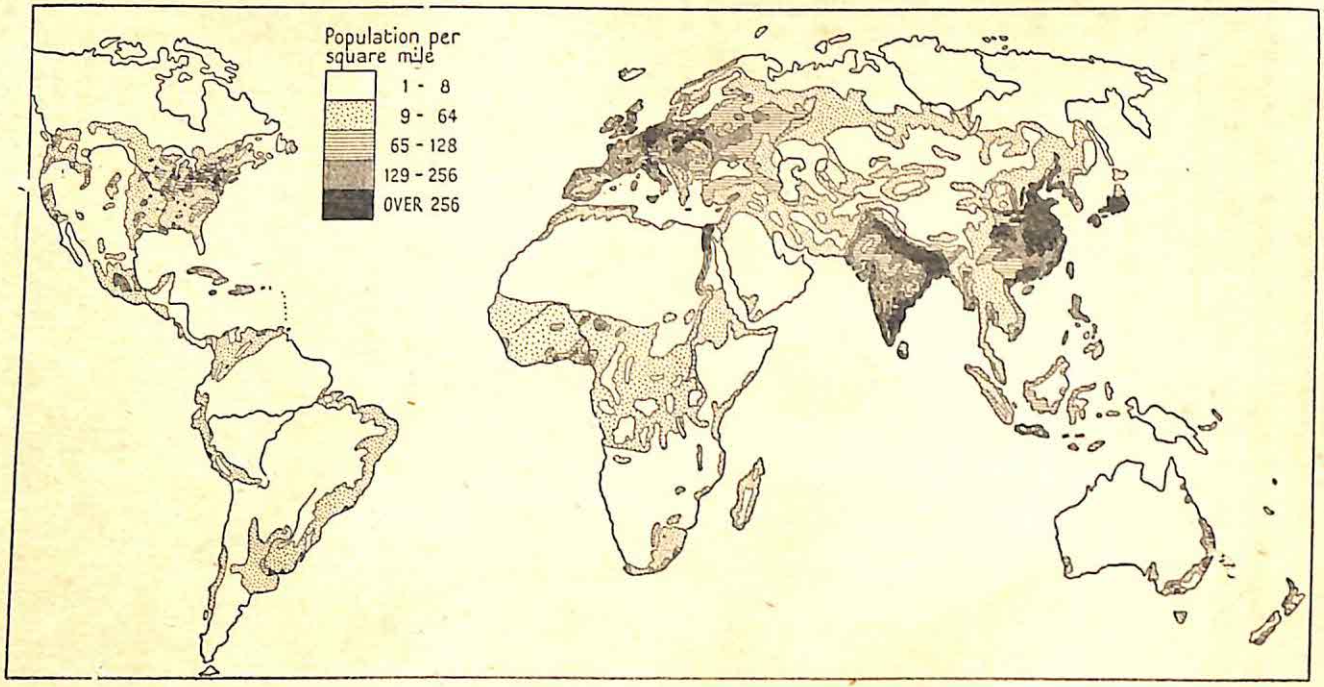


FIG. 51. The World. Density of Population.

the United States) petroleum, are able to support a much larger population than they could if their inhabitants depended on agriculture for their livelihood. In short, the economic prosperity of the great manufacturing nations may be said to depend on their supplies of power—the essential element in modern manufacture.

The Asiatic monsoon lands with their very wet, very hot summers and drier cool seasons are extraordinarily productive, and owing to their great fertility have become one of the most densely inhabited regions on earth. In parts of China the number of people over considerable areas exceeds 2,000 to the square mile, while the greater part of this vast country is intensely cultivated and thickly inhabited.

Parts of the tropical forests of South-East Asia are thickly populated, for most of this region consists of islands and peninsulas that are easily penetrated from the sea. Moreover, the sea has a moderating effect on their climate, making them healthy when compared with a region such as the Amazon. This area has been developed by white peoples, mainly British and Dutch. In Malaya there are over 650 people to the square mile; in Java the number exceeds 700; and over the whole area, if we exclude these two regions, densities are roughly between 30 and 40 to the square mile. A further study shows that the larger (and, therefore, the less accessible) the island, the less dense is the population.

For generations the lands round the Mediterranean Sea have been comparatively densely peopled, and in those parts of the world with a similar climate settlement is steadily increasing. In most 'Mediterranean' regions man is mainly a farmer; in Europe and North Africa, owing to the mountainous nature of the land and the necessity for irrigation, farms are small and every foot of suitable land is intensely cultivated.

The temperate grasslands, such as the prairies, pampas, and steppes, are not thickly peopled. The construction of trans-continental railways has, however, played a great part in their development, and in each area the most populous belts are those lying within reach of the line. Nothing that man can do for the opening up of a country is more effective than the building of railways.

The extent of the arid area in Australia has limited settlement chiefly to the more favourable climatic areas along the south-east and east coasts. In both Australia and South Africa the development of irrigation is enabling fresh areas to be settled.

The Population Map of the world (Fig. 51) shows that the cold deserts and tundra, the coniferous forests, and the hot deserts and arid lands are almost uninhabited. Here and there in the latter regions, mining settlements, as, for example, the gold-fields of Western Australia, form populated patches amidst sandy wastes; while irrigated areas like the narrow Nile valley, crossing the east of the Sahara, support a large number of people, especially in Egypt where in the valley itself and the Nile delta is found one of the densest populations in the world.

From the point of view of population the vast tropical forests of the Amazon are one of the world's desert areas, for in spite of their wonderful luxuriance, these regions have less than one person to the square mile. In these ever-hot, ever-wet *selvas* there is a continual fight between Man and Nature; the forest soon reconquers any clearing, and it is only by constant effort that Man can hold his own.

On the other hand, the forests of the Congo, with eleven persons to the square mile, are somewhat less sparsely populated. This is largely due to their greater elevation, which causes the forests to be less dense and at the same time more healthy than those of the Amazon. The forests along the coastal belt of West Africa are even more thickly peopled. As in South-East Asia, this region owes it development to Europeans. In Southern Nigeria there are over 100 persons to the square mile, while less densely populated areas such as the Gold Coast and Sierra Leone have more than twenty to the square mile.

EXERCISES

1. Name the three primary races into which mankind is usually divided. In the case of each write short notes on their (*a*) colour and general appearance, including stature, facial appearance, and texture of the hair; and (*b*) general distribution throughout the world.

2. Confining your answer to the Northern Hemisphere, choose *one* densely peopled region and *one* sparsely peopled region and account for the denseness or sparseness of each.

3. Throughout most of the Amazon Basin there is less than 1 person to the square mile; in the Congo there are 11 persons to the square mile; and in Java there are over 700 persons to the square mile. Each of these areas lies in the Equatorial Forest Belt. How do you account for the differences in the density of population?

4. Into what three races may the people of Europe be divided? Describe briefly the characteristics and distribution of each. What parts of the world, outside Europe, are mainly inhabited by people of European descent?

CHAPTER IX

MAPS

Scales, &c. Much may be learned from a study of maps, and to those who can read them they are fascinating things. When a piece of country is represented on a map the drawing is, of course, very much smaller than the actual area. But it is proportionate in every part to the district or region it represents. In short, it is drawn to scale. *A Scale shows the* PROPORTION *that the distance between any two points on a* MAP *bears to the distance between the same two points on the* GROUND.

In atlases maps are rarely drawn to the same scale, because while the countries represented differ greatly in size, the pages of the atlas are all alike. On pages of the same size the map-maker represents Great Britain, about 600 miles in length, and North America, more than six times as long. Maps, such as these, on which 1 inch represents a distance of many miles on the ground, are called Small-scale Maps.

Most ordnance maps of the British Isles are drawn on a scale of a ¼-inch, ½-inch, 1-inch, or 6 inches to 1 mile. Maps, like these, which represent a small area with a large amount of detail are known as Large-scale Maps. As there are 63,360 inches in 1 mile, a map on which 1 inch represents 1 mile on the ground is said to be drawn to a scale of 1:63,360. This scale is also written thus: $\frac{1}{63,360}$, and this fraction is called the *Representative Fraction* (R.F.). Note that the numerator of the Representative Fraction must always be 1.

Example. The scale of a map is 6 inches to a mile. What is the Representative Fraction?

$$\text{R.F.} = \frac{\text{map}}{\text{ground}} = \frac{6 \text{ ins.}}{63,360 \text{ ins.}} = \frac{1}{10,560}$$

Representation of Heights. On maps heights are represented in various ways. On many maps they are shown by using colours. On others by shading. The highest lands are represented by the darkest shading, the next in height by less dark shading, and so on. On some

large-scale maps hachures, or short shading lines, are used to denote relief. Such lines are drawn directly down the slopes, and as the steepness of the latter increases so, too, is the number of hachures increased. Thus the shading on a hachured map shows how the slope varies from place to place. On ordnance maps the heights of certain points are marked thus, ·480. Such heights are known as spot heights.

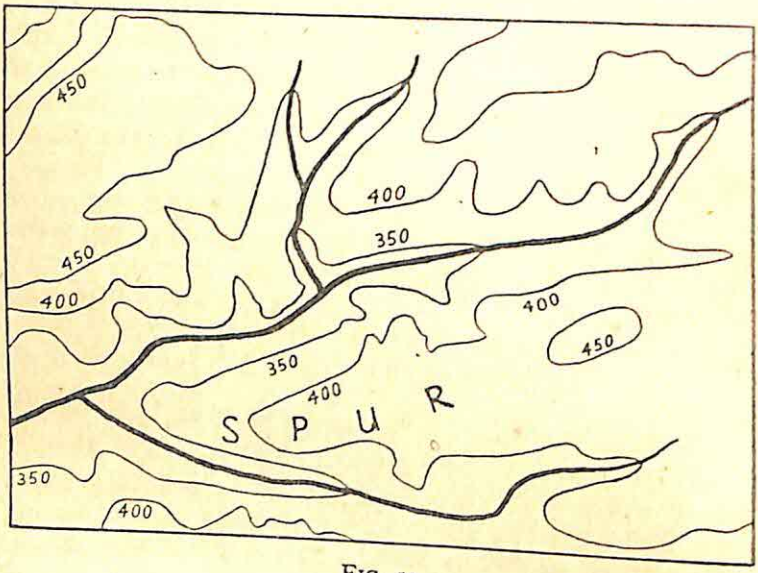


FIG. 52.

If we examine a 1-inch ordnance map we shall notice clusters of thin lines forming figures of irregular shapes, each line being marked with a number. These lines are *contour lines which have been drawn to join places of equal height above sea-level.* For example, one line may be marked 400 and the next 300. This indicates that the land on these lines is 400 and 300 feet respectively above sea-level; and that the land between them varies in height between 400 and 300 feet. If the lines are close together the slope is steep; lines farther apart indicate a more gradual slope. The vertical height of one contour above another is known as the *Vertical Interval* (V.I.). On most British ordnance maps the Vertical Interval is either 50 or 100 feet.

Examine Fig. 52 showing three river valleys. Note that each

valley is V-shaped. Note also the point where each stream cuts across the contour lines. You will see that at each of these points the contours are V-shaped, and that the arrows formed by the contour

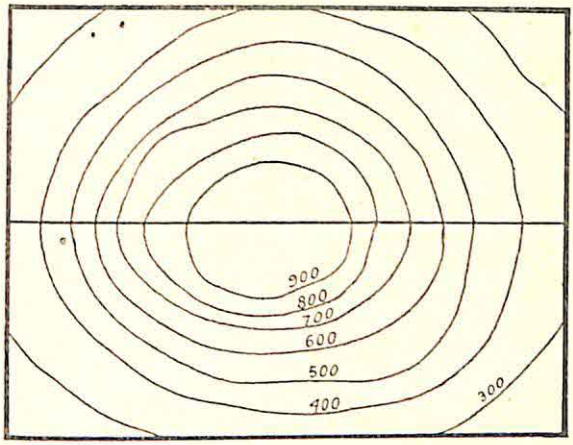


FIG. 53.

lines and the streams point up-stream towards the source. Note that the Spur, projecting between the two main valleys, is U-shaped. On an ordnance map distinguish between the spurs and the valleys which follow alternately. Note also the ring contours which denote hills (Fig. 53).

The slope between any two points on a map is said to be *concave* when one point is visible from the other. If one point is not visible from the other then the slope is said to be *convex*.

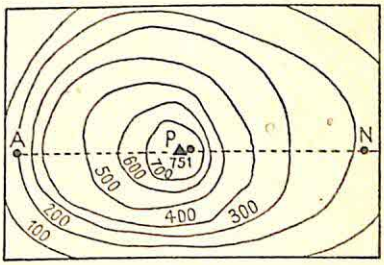


FIG. 54.

Look at Fig. 54. First note the ring contours around the hill. We learn that the first portion of the upward slope from *A* to *P* is steep because the contour lines are close together. The second part of the slope is gradual, for the contour lines are farther apart. Thus the slope is convex. *P* is not visible from *A*.

Now examine the slope between *P* and *N*. Starting from *P* the

downward slope is steep. Towards *N* it becomes gradual. The slope is concave. *P* is visible from *N*.

It is, of course, easy to tell whether a slope is concave or convex by drawing a section (Fig. 55); but if we study contour maps we shall soon be able to dispense with this method.

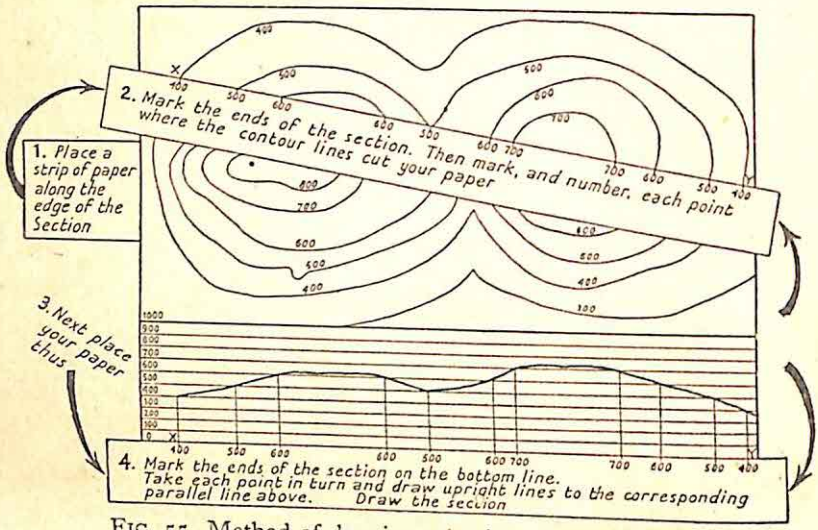


FIG. 55. Method of drawing a section of a contour map.

Setting a Map. Maps are made for practical use. If we are going to use our ordnance maps out of doors we must learn how to set them. There are several ways of doing this.

(1) If we can see some object such as a church (*C*), and if we know the point on the map that represents our position (*P*) on the ground, we can arrange the map so that the line *PC* on the map corresponds to the line *PC* on the ground.

(2) If we are stationed on a piece of fairly straight road we can arrange our map so that the road as shown on the map corresponds in direction with the actual road on the ground. When we are at the junction of two or more roads, this method is an easy one.

(3) Setting a map with a compass. First set off from a point at the side of the map an angle representing the magnetic variation of the compass (see p. 13). The line so obtained will point to the magnetic north. Now place the compass on the map until the needle is at rest. Then lift the compass very carefully, and turn the map round

until the needle is parallel to the magnetic north line on the map. Replace the compass on the map. The arrow-head, indicating the Magnetic North, now points in the same direction as the magnetized end of the compass needle. The map will then be set.

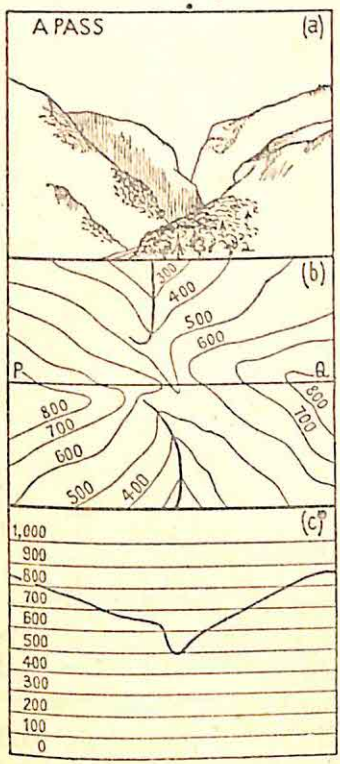


FIG 56.

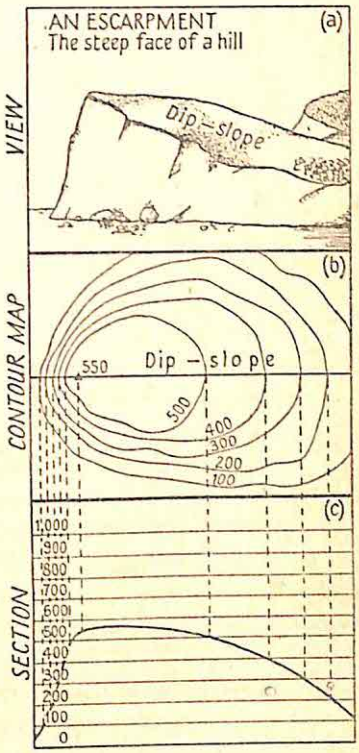


FIG. 57.

FIG. 56. A Pass or Col. (*a*) Sketch of view; (*b*) contour map; (*c*) section.
FIG. 57. An Escarpment. (*a*) Sketch of view; (*b*) contour map; (*c*) section. Notice the long gradual dip-slope. [*The vertical scale is exaggerated.*]

Map Projections. As the earth is a sphere its surface is curved and not flat. Thus this surface can only be correctly represented on a globe. It is impossible to show it with absolute accuracy on a plane, or flat surface, but it is possible to do so with relative accuracy.

When the curved lines of latitude and longitude on the globe are transferred to the flat surface of the map, such transference is called

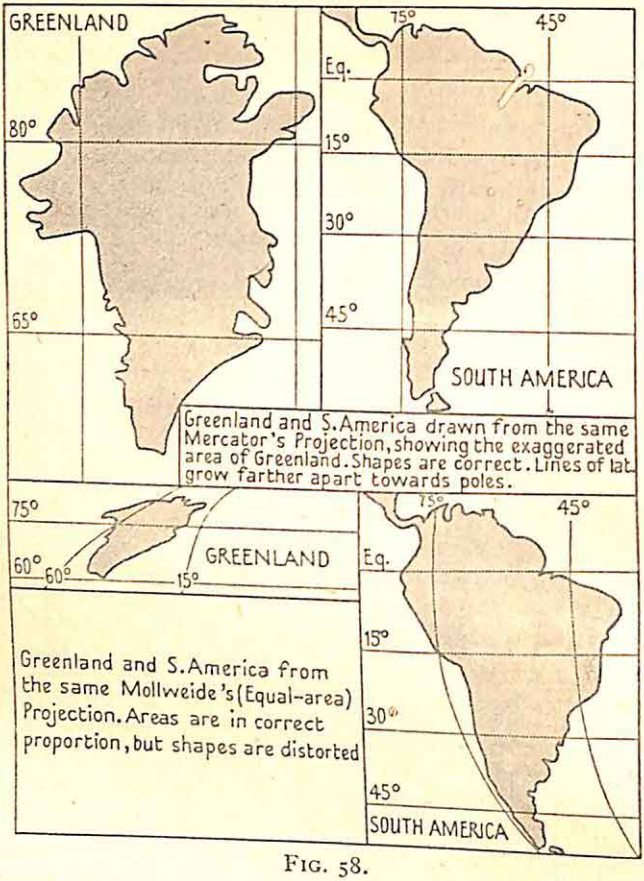

GREENLAND
80°
65°
75°
45°
Eq.
15°
30°
45°
SOUTH AMERICA
Greenland and S.America drawn from the same Mercator's Projection, showing the exaggerated area of Greenland. Shapes are correct. Lines of lat. grow farther apart towards poles.
75°
60°
60°
15°
GREENLAND
Greenland and S.America from the same Mollweide's (Equal-area) Projection. Areas are in correct proportion, but shapes are distorted
75°
45°
Eq.
15°
30°
45°
SOUTH AMERICA

FIG. 58.

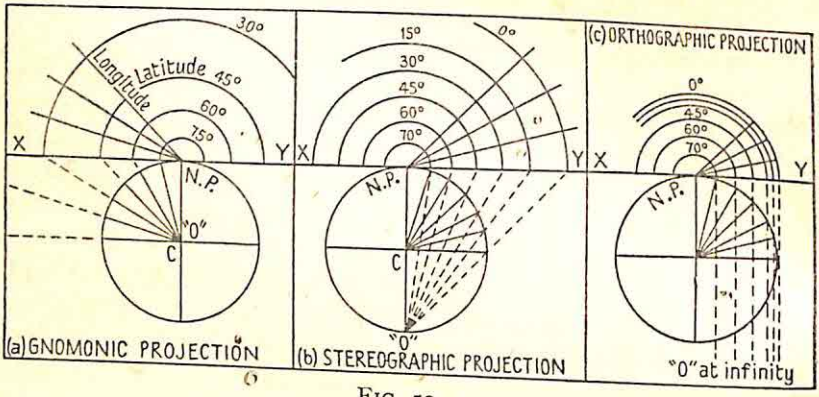

30°
Longitude
Latitude 45°
60°
75°
X
Y
N.P.
"0"
C
(a) GNOMONIC PROJECTION
15°
0°
30°
45°
60°
70°
X
Y
N.P.
C
"0"
(b) STEREOGRAPHIC PROJECTION
(c) ORTHOGRAPHIC PROJECTION
0°
45°
60°
70°
X
Y
N.P.
"0" at infinity

FIG. 59.

projection. There are various types of projections in which the lines of latitude and longitude are adjusted according to the type of map and the purpose for which it is required.

Some maps, like those drawn on Mercator's Projection, show *direction* correctly. They are called *Orthomorphic Maps*, but though the *shapes* of individual regions are *correct*, their *relative areas* are *wrong*. Such maps show great exaggeration towards the poles, the parallels of latitude growing farther and farther apart with increasing distance from the Equator. For example, though the shapes of Greenland and South America are correct, their relative areas are incorrect.

Other maps, known as *equal-area* maps, show the correct proportion of the different areas on the globe, but the shapes of such areas are incorrect, especially towards the margins of the map. In Fig. 58 compare the respective shapes and areas of Greenland and South America which are drawn on (i) Mercator's Projection, and (ii) Mollweide's (equal-area) Projection.

It is impossible to construct a map network, or *graticule*, so that both the directions and the areas are correct. It is, however, possible to draw maps on which the lines of latitude and longitude, forming the graticule, can be adjusted so as to lessen greatly the margin of error.

The construction of map projections involves advanced mathematical calculations, but the principles on which they are made are easily understood. They are perhaps best grasped by placing an electric bulb in the centre of a wire globe or one of glass on which have been drawn lines to represent the parallels of latitude and the meridians of longitude. These lines can then be projected on to a sheet of paper placed in various positions according to the type of projection which it is required to illustrate.

There are three main groups of map projections.

(1) **Projection on a plane tangent to, that is touching, the globe.** This type of projection is known as a *Zenithal Projection.* Imagine a light placed behind a wire or glass globe in various positions as indicated below. These positions will explain the principles of the three main types of Zenithal Projections, namely (*a*) *Gnomonic*, (*b*) *Stereographic*, and (*c*) *Orthographic.*

In Fig. 59 (*a*), (*b*), and (*c*) imagine a sheet of paper resting horizontally upon the globe so that it touches the North Pole, or in other words so that the plane of projection is tangent to the North Pole (N.P.).

In each of the three diagrams the radii from *C* (representing the earth's centre) are drawn at intervals of 15°. The points where they cut the respective circumferences represent the latitudes.

The projections are completed by drawing, as shown, (i) circles, with centres at the North Pole (N.P.), to represent the parallels of latitude; and (ii) straight lines, radiating from the North Pole, at intervals of 15°, to represent the meridians of longitude.

In Fig. 59 (*a*) the source of light (*O*) is at the centre (*C*). The radii are produced to meet the plane of projection *XY*. Compare the distance between the parallels of latitude 75° and 60° with that between 45° and 30°, and note that towards the Equator the exaggeration becomes steadily greater. On a Polar Gnomonic, such as that represented here, the Equator cannot be shown owing to this exaggeration.

In Fig. 59 (*b*), representing the stereographic projection, the source of light (*O*) is at the South Pole.

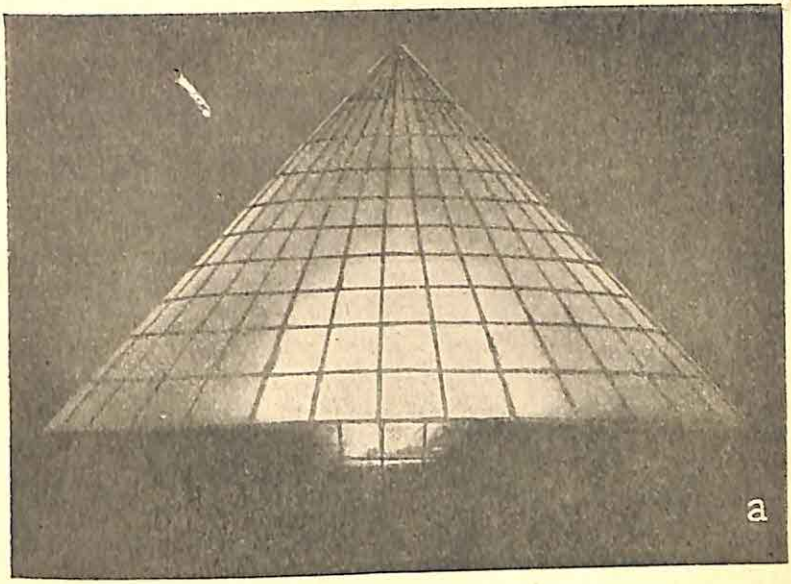
In Fig. 59 (*c*), representing the orthographic projection, the source of light (*O*) is supposed to be at infinity.

If the plane of the projection is tangent at the Equator, we obtain an *Equatorial Zenithal Projection.*

Zenithal Projections are frequently used to construct *equal-area maps.* Such maps are useful for showing the distribution of crops and the relative size of different countries, &c. In actual construction they are modified by adjusting the parallels according to the type of map. Among the best-known equal-area projections is *Lambert's Zenithal Equal-Area Projection*, frequently used in atlas maps.

Mollweide's Projection is a greatly modified projection in which the earth is represented as an ellipse. On such maps the major axis, representing the earth's equatorial circumference, is twice as long as the minor axis represented by a meridian of longitude drawn from pole to pole.

(2) **Conical Projections** are frequently used to represent relatively small areas, such as individual countries. The principles on which this projection is based are illustrated by Fig. 60 (*a*). A sheet of paper, folded to form a cone, rests on a glass globe, so that its apex is over the North Pole. The globe has a light in the centre, and on it are marked lines representing the parallels of latitude and the meridians of longitude. Shadows of these lines are projected on to the cone, upon which they are traced. The cone is then unfolded, as shown in Fig. 60 (*b*). It will be noticed that the meridians of



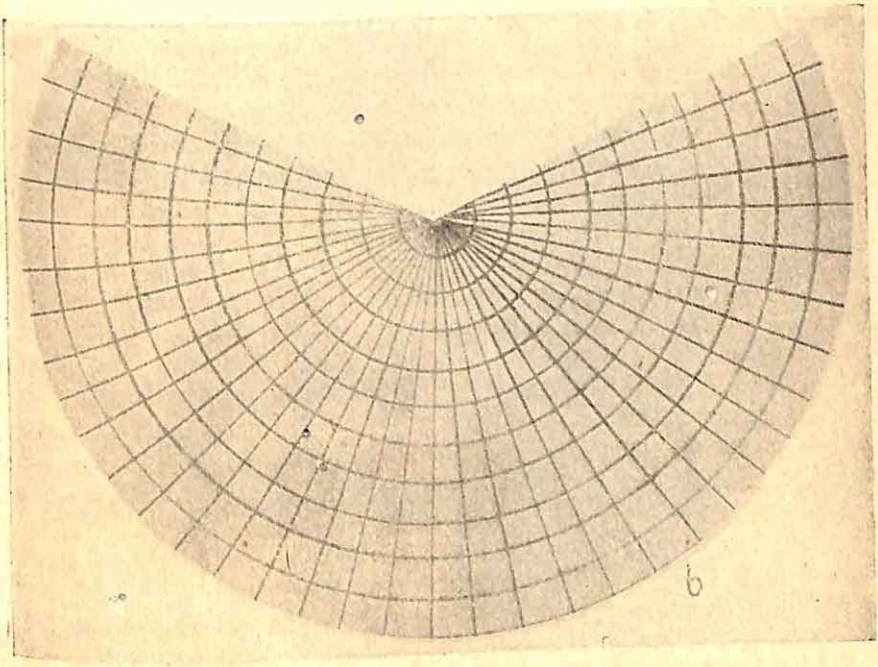


FIG. 60. Conical Projection

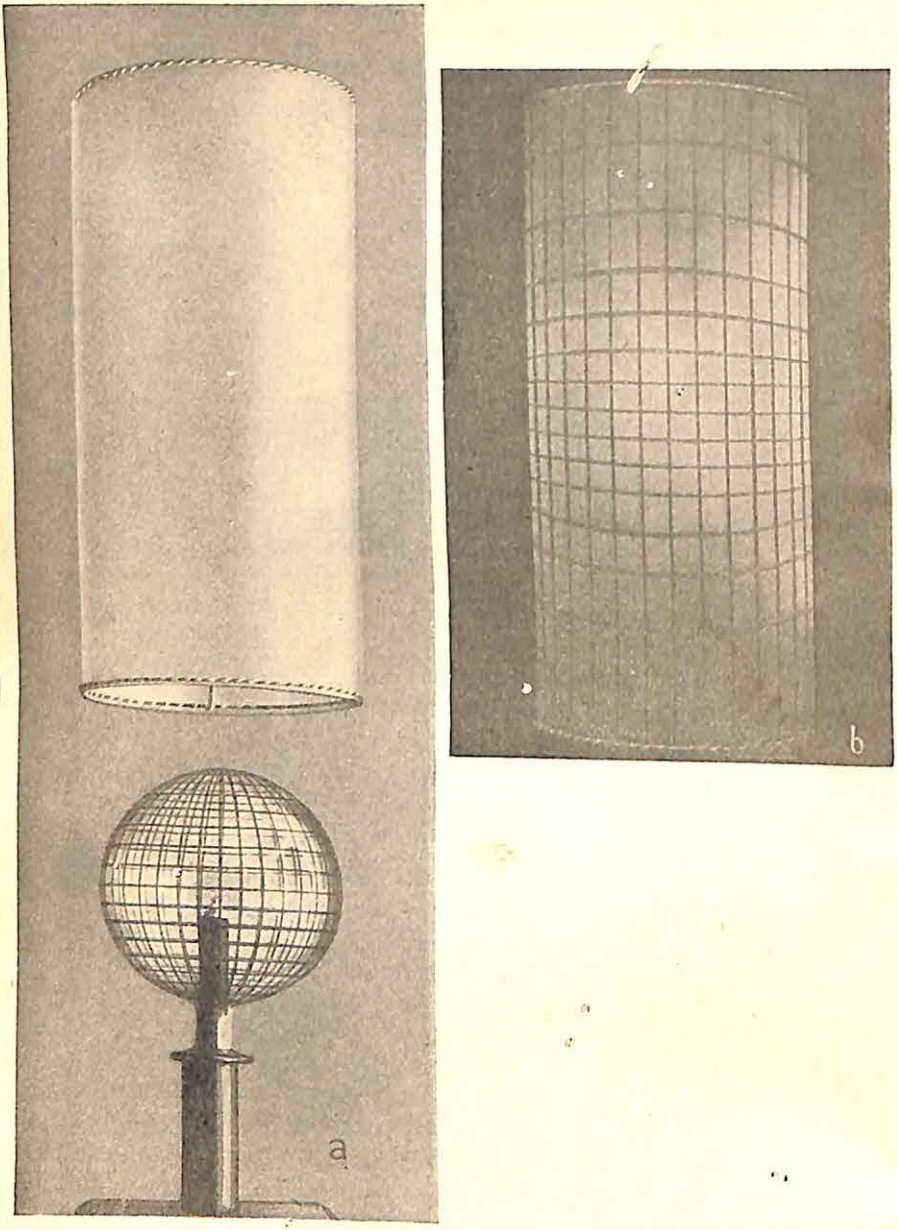


Fig. 61. Cylindrical Projection.

longitude are straight lines diverging from a common centre, and that the parallels of latitude form arcs of concentric circles.

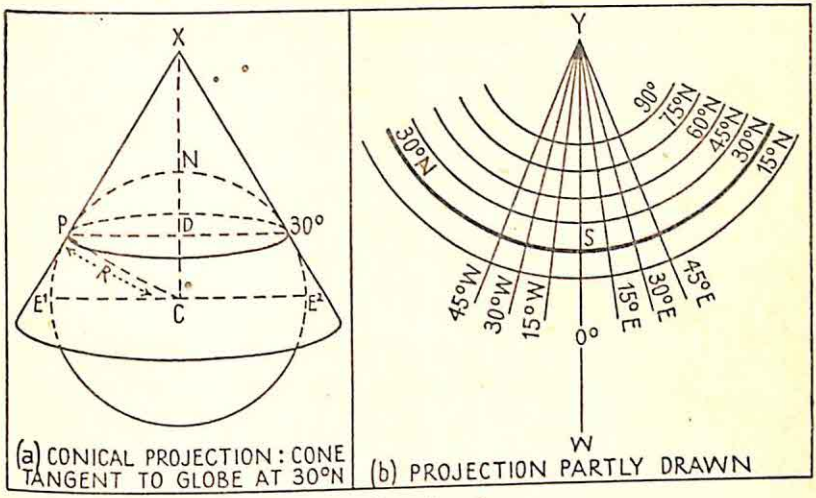


FIG. 62.

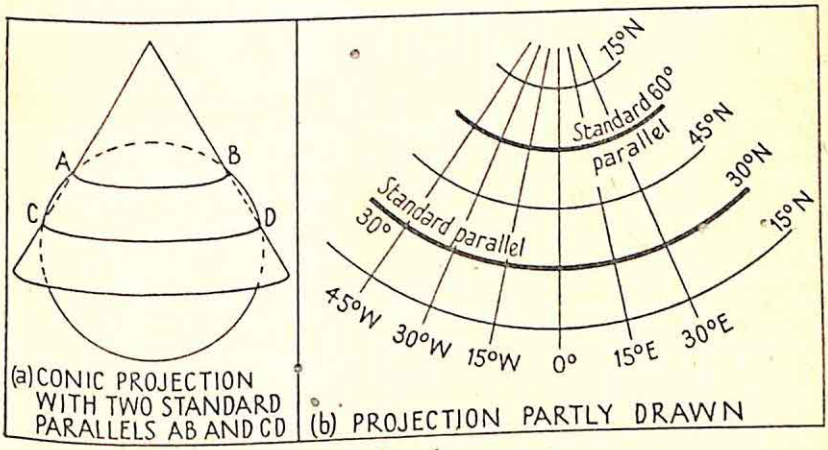


FIG. 63.

Figure 62 (*a*) represents a cone tangent to, or touching, a globe along latitude 30°, which is the *standard parallel.* The apex (*X*) of the cone is directly over the North Pole (N.P.). At latitude 30°, and for some distance on either side, the map will be approximately

correct and will not differ greatly from the outline on the globe. Fig. 62 (*b*) shows the projection partly drawn. One of the best-known conical projections is *Bonne's Projection.*

A modified form of conical projection, with two standard parallels, instead of only one, is frequently used. The cone is supposed to *cut* the globe along two lines instead of merely touching its surface along one line. In Fig. 63 (*a*) the cone is shown cutting the surface along

Globular

FIG. 64.

Mercator

FIG. 65.

parallels 30° and 45°. The map will be correct along the standard parallels, but beyond them the latitude distance is exaggerated, while between them it diminishes somewhat.

(3) **Cylindrical Projections.** The principle on which these projections are based can be best understood by placing a cylinder over a glass globe with a light in the centre. Fig. 61 (*a*) shows the cylinder about to be placed over the globe. In Fig. 61 (*b*) we can see the lines projected on the cylinder which is now in position over the globe. It will be noticed that (*a*) the parallels of latitude near the light, in the centre of the globe, are relatively close together, but that they grow farther and farther apart towards the poles; (*b*) the meridians are parallel lines equidistant from each other, and consequently, as they do not meet at the Poles, the Polar Region cannot be properly shown on maps drawn on a cylindrical projection; (*c*) the lines of latitude and longitude intersect at right angles.

One of the best-known cylindrical projections is *Mercator's Projection*, which is of especial use to mariners, as it is an *orthomorphic projection* showing the correct *direction*, and the correct *shapes* of areas. Its disadvantage is the great exaggeration towards the Poles, which are not, as we have seen (Fig. 58), actually shown on the map. The exaggeration of scale towards the poles is well illustrated by Fig. 64, showing a monk's head drawn on a globe, and Fig. 65, the head as it would appear in Mercator's Projection.

Like most projections Mercator's Projection is modified. The principle of its construction is that the exaggeration from north to south is made equal to that from east to west. This means, for example, that latitude 60°, actually half the length of the equator, is doubled in length, and that distances north and south at this point are also doubled. On Mercator's Projection the only *great circles* (see p. 12) represented by straight lines are the equator and the meridians of longitude.

EXERCISES

1. What do you mean by the *scale* of a map? What are the chief scales used on British ordnance maps?

2. What is a *representative fraction*? Express as representative fraction the scales of maps on which (*a*) 1 mile is represented by ¼ inch, 1 inch, and 25 inches; and (*b*) 360 miles are represented by 1 inch. Which of the above maps is a small-scale map?

3. A valley running roughly north to south is 10 miles long. It is bordered by hills rising steeply on the west to 1,100 feet, and more gradually on the east to 800 feet. A stream flows through the valley. After flowing for about 5 miles it receives two tributaries which flow into it from the north-west and north-east respectively. The main stream leaves the valley at a height of 100 feet and then winds across a plain to the sea, which is 10 miles away to the south. The river forms a delta at its mouth. (*a*) Draw a contour map to represent the above piece of country. Represent 4 miles on the ground by ½ inch on your map. Insert contours every 100 feet. (*b*) What is the vertical interval of your map? (*c*) Express the scale as a representative fraction. (*d*) Is the mouth of the river strongly tidal?

4. A ridge measures 6 miles from east to west and 4 miles from north to south. The top is a plateau, about 350 feet above sea-level, measuring 2 miles from east to west and 1½ miles from north to south. The slope of the ridge is much steeper on the south than on the north. Draw a contour map to represent the ridge. Insert contour lines for every 50 feet. Horizontal scale ½ inch to 1 mile.

5. Draw contour sketches to show a peak, a pass, an escarpment, a rift valley, a canyon, and a fiord.

6. The lower portion of a W.–E. dale opens out on the east into a large river plain, which is rather below the 100 foot contour line. The dale itself varies from a mile to 3 miles broad, and is, as the crow flies, 16 miles long. Hills rise on each side of the dale; the highest point on the north side is 1,000 ft., on the south 800 ft. The dale is traversed by a river which has only one important tributary stream, *A*, entering from the north, not quite half-way down. Two smaller streams, *B* and *C*, enter, *B* from the north and *C* from the south, almost opposite each other, half-way between the mouth of *A* and the mouth of the dale. There are two market towns, *D* at the lower end of the dale and *E* 12 miles farther up. A large reservoir, *F*, has been built on stream *A*, and another, *G*, on stream *C*. Both reservoirs are about 400 ft. above sea-level. Construct a contour map to show this dale.

7. What do you understand by the term *map projection*? On what principle is Mercator's Projection constructed? What are (*a*) the advantages, and (*b*) the disadvantages of this projection?

8. Name a suitable projection on which to draw a map (*a*) to represent a relatively small area, such as England; and (*b*) to show the world distribution of wheat. In both cases give reasons for your answer.

PART II

EUROPE

CHAPTER X

GENERAL SURVEY OF EUROPE

With the exception of Australia, Europe is the smallest of the continents. It has an area of 3¾ million square miles—little more than one-fifth that of Asia, of which it forms a western peninsula. The Urals form no real physical boundary, and so closely are Europe and Asia united that when considered as a whole the term *Eurasia* is applied to them. On the north, the Arctic Ocean washes the shores of both continents, but while Europe looks towards the Atlantic and the Mediterranean, Asia faces the Pacific and Indian Oceans. Despite their marked physical resemblances, the differences in their development, civilizations, and peoples are so striking that this great land mass is rightly considered as two separate continents.

Europe has a more extensive coast-line, in proportion to its size, than any other continent. Few places are more than 400 miles from the sea, and even the heart of European Russia is only 700 miles distant from the ocean.

Fig. 66 shows that from the south-east of the Bay of Biscay shallow seas spread west of the British Isles and south-west of Norway. These seas cover the *Continental Shelf*, which is the name given to *the submerged margins of continents covered with relatively shallow water to a depth not exceeding 600 feet.* In geologically recent times, this now submerged area formed part of an ancient land mass, and if the ocean bed were raised 600 feet a portion of its former outline would be restored, and the British Isles would once more form part of the mainland. So shallow, indeed, are the North Sea and the Straits of Dover, that if St. Paul's Cathedral were sunk in the deepest part of the latter channel its dome would rise above the surface of the water.

The sinking of the continent, by allowing the ocean to extend through the North Sea into the Baltic, has opened up the heart of North-West Europe. Another result is that the lower courses of many rivers have been converted into estuaries, at the head of which

now stand some of the world's greatest ports. In the south, the Mediterranean and Black Seas provide a sea-way extending more than 2,000 miles from the Atlantic, while the Adriatic arm of the Mediterranean provides an outlet for the southern part of Central Europe.

The Mediterranean is divided into an *Eastern* and a *Western*

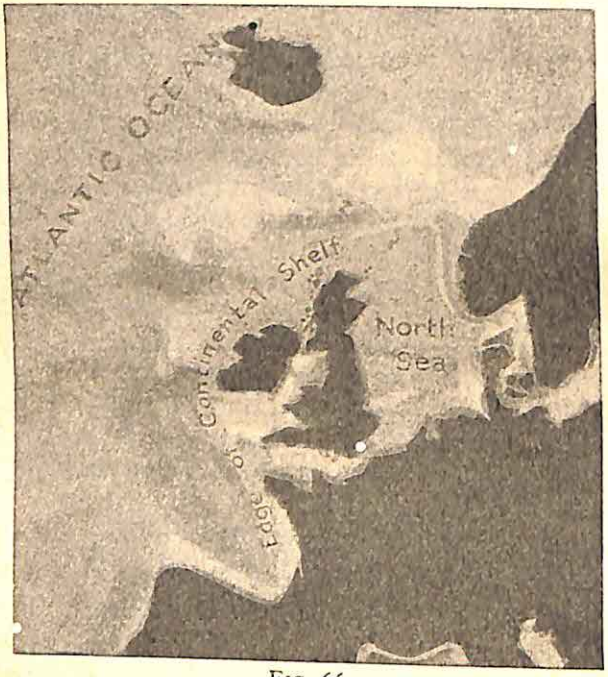


FIG. 66.

Basin, separated by a submerged ridge running from Tunis to Sicily. This ridge, together with a similar one across the Straits of Gibraltar, once formed a 'land-bridge' connecting Europe and Africa. The Mediterranean may, indeed, be regarded as a link rather than a barrier, and the lands around its shores—though forming parts of three separate continents—are unified by their climate, vegetation, and communications.

Relief. Europe falls into four main physical divisions.

(1) **The North-West Highlands** consist of the Highlands of Scotland and Scandinavia, both of which are disconnected fragments

of the ancient continent. They are composed of old, hard, crystalline rocks which, owing to long-continued denudation, have been so worn down that they now form irregular plateaus of the type known as dissected plateaus. Each of these regions is bordered by a steep fiorded coast on the west, and a plain on the east.

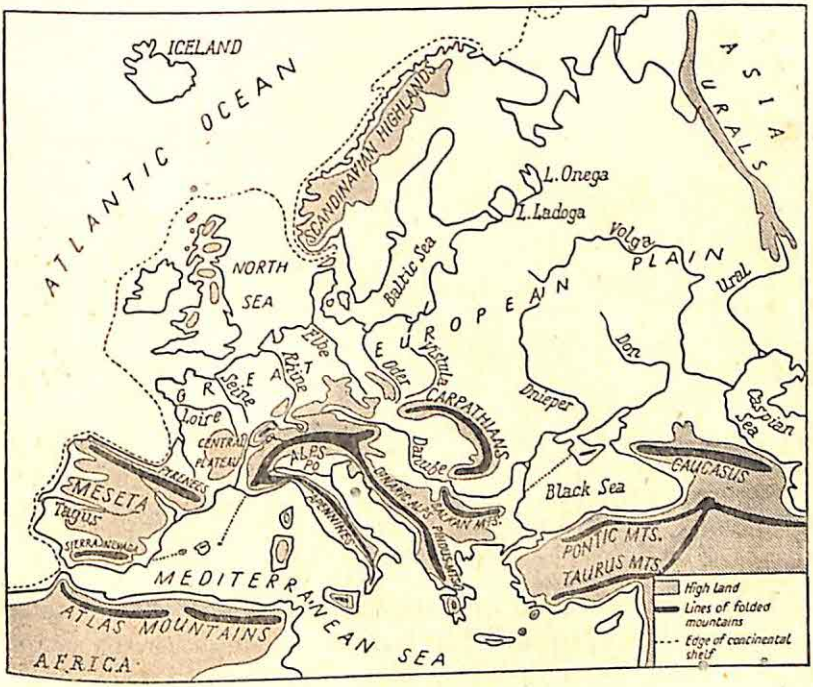


FIG. 67. Europe: Relief.

(2) To the south of these dissected plateaus lies the **Great European Plain** extending from the shores of the Bay of Biscay through Northern France, Belgium, Holland, Northern Germany, and Poland, into Russia, whence it merges into the plains of Asia.

(3) **The Central Uplands of Europe** stretch across the centre of the continent. Once they formed a continuous chain, but now only detached and much-denuded fragments remain. Considerable faulting, or fracturing, has taken place. Some areas have been uplifted to form crust-blocks: others have subsided. Among the chief of these elevated blocks are the Meseta of the Iberian Peninsula,

the Central Plateau of France, the Highlands of Brittany, and those of Cornwall and South-West Ireland; the Ardennes, the Rhine Highlands, the Vosges, and Black Forest Ranges flanking the Rift Valley of the Rhine; the Bohemian Uplands, and the Rhodope Highlands. The islands of Corsica and Sardinia, margining the Tyrrhenian Sea, are isolated crust-blocks.

(4) **The South European Fold Mountains**, geologically much younger than the Central Uplands, form part of a great system of

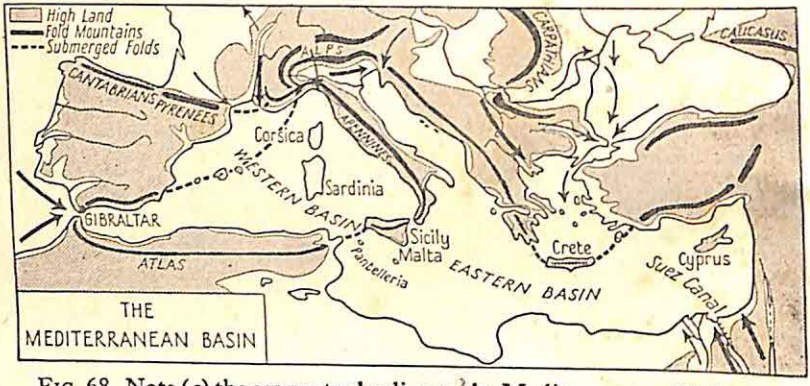


FIG. 68. Note (*a*) the sea routes leading to the Mediterranean; (*b*) the routes leading (through the passage between Sicily and Africa) from the Western to the Eastern Basin; (*c*) the land routes leading to the Mediterranean Sea.

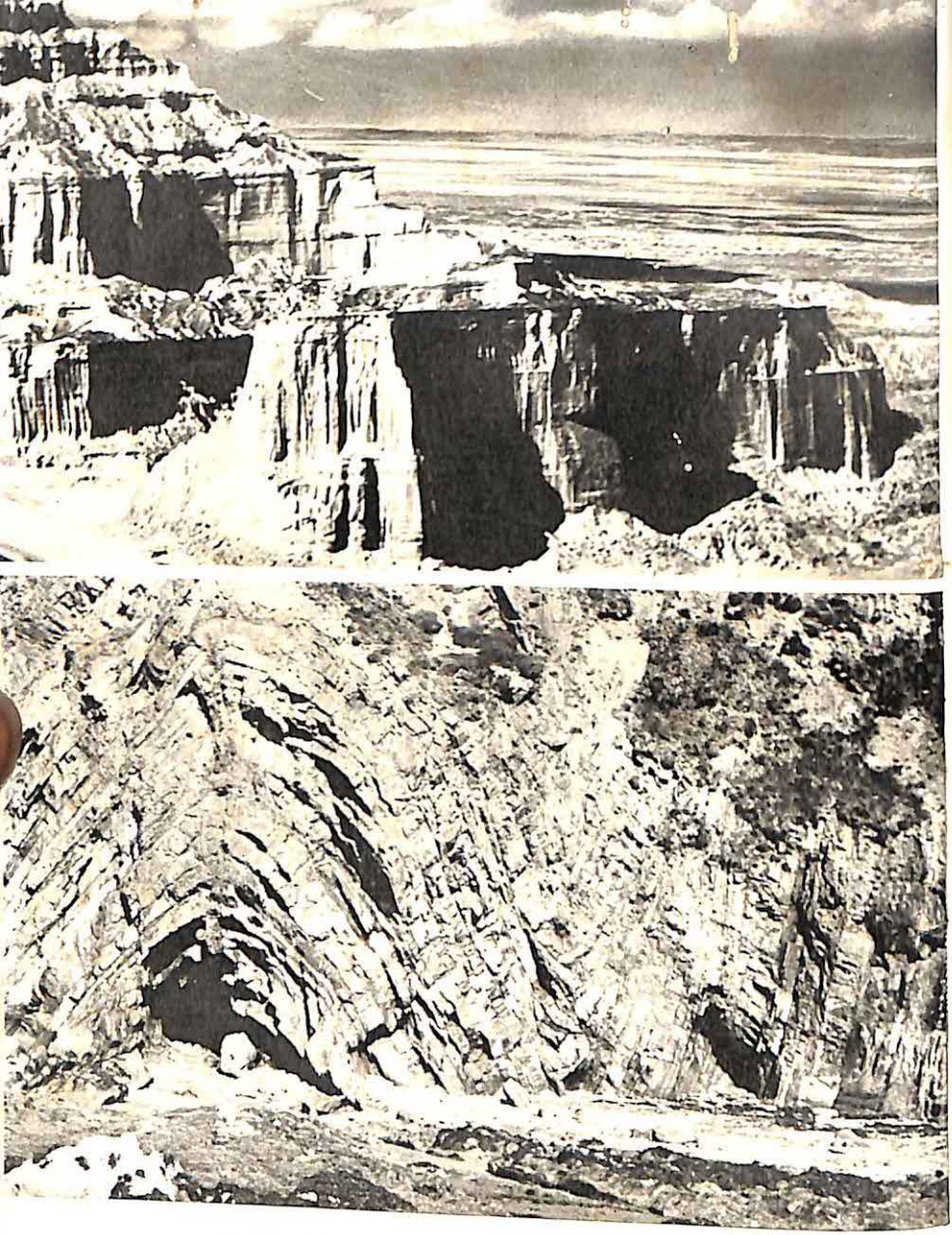
fold mountains extending from the Cantabrians, across Europe and Asia to the Himalayas. The chief European mountains in this system are the Cantabrians, Pyrenees, Alps, Carpathians, Transylvanian Alps, Balkan Heights, and the Caucasus. From the Alps two other lines of fold mountains trend southward. (i) The Apennines, which form the backbone of Italy, are continued through Sicily, whence the folds form the Atlas Mountains of Northern Africa. They then curve sharply and may be traced through the Sierra Nevada Mountains of Southern Spain, reappearing in the Balearic Islands. (ii) The folds forming the Dinaric Alps, and their continuation the Pindus Mountains, are continued through Crete and Cyprus to the Taurus Mountains in the south of Asia Minor.

These fold mountains enclose the Plain of Lombardy, the Plain of Hungary, and the Western Basin of the Mediterranean.

Broad 'gates' in the Central Uplands and the European Fold

5. THE WORK OF ICE

The photograph (*above*) shows the origin of a glacier from a sheet of inland ice barely seen in the background. The lateral moraines can be seen at the sides of the two glaciers, and the medial moraine (*bottom right*) where they unite. (*Below*) Erratics on the Canadian prairies. These isolated rocks were transported for several hundreds of miles by the Ice Sheet which once covered the north of North America (see pp. 29 and 389). Photograph by the author.



6. THE CHANGING FACE OF NATURE

ove) Cliffs along the Persian Gulf showing the effect of wind erosion (see p. 24). (*Below*)
ffs at Newport, Pembrokeshire showing an anticline (upfold) and a syncline (downfold).

Mountains form important channels of communication. Among the chief are: the Gate of Carcassonne between the Pyrenees and the Central Plateau of France; the Rhone-Saône valley between the Central Plateau and the Alps; the Burgundian Gate between the Jura and the Vosges; and the Moravian Gate between the Bohemian Plateau and the Carpathians. The most important Alpine passes are the Mont Cenis, the Simplon, the St. Gotthard, and the Brenner.

Among the leading 'sea-gates' are the Straits of Dover leading from the English Channel to the North Sea, and the Skagerrak, Kattegat, and Great Belt linking the North Sea with the Baltic. In the Mediterranean, the Straits of Gibraltar lead from the Atlantic to the Western Basin of that Sea, while the Sicilo-Tunisian Gate gives access to the Eastern Basin, which is linked with the Black Sea by the Dardanelles-Bosporus.

Rivers. Though the rivers of Europe cannot compare in length or volume with those of Asia, the Americas, or Africa, they are among the most important in the world. Most of them are navigable, and at the heads of their estuaries and along their banks stand some of the world's chief cities.

The Rhine (760 miles), the Rhone (490 miles), and the Po (415 miles) all rise in the Alps; and though the source of the Danube (1,700 miles) is in the Black Forest Range, some of its chief tributaries rise in the Alps. But though the headwaters of these four rivers are comparatively near one another, they all flow in different directions, and during part of their courses their valleys form routes leading from Central Europe to the sea. The Rhine flows into the North Sea, the Rhone into the Mediterranean, the Po into the Adriatic, and the Danube into the Black Sea.

The Vistula (630 miles), the Oder (580 miles), and the Elbe (690 miles) rise in the Central Uplands and flow across the European Plain, the two former rivers entering the Baltic, the latter the North Sea.

In France the Seine (480 miles) pours its waters into the English Channel, and the Loire (570 miles) and the Garonne (350 miles) into the Bay of Biscay. In the Iberian Peninsula the Douro (460 miles), the Tagus (510 miles), and the Guadalquivir flow into the Atlantic, and the Ebro (420 miles) into the Mediterranean.

The Dniester (700 miles), the Dnieper (1,200 miles) and the

Don (1,200 miles) all fall into the Black Sea. The Volga (2,200 miles), Europe's longest river, winds south across the Russian Plain and empties its waters into the land-locked Caspian, the centre of a large inland drainage area. The Pechora and the Dvina flow into the Arctic.

The Great Ice Sheets. Northern Europe was once covered by a great Ice Sheet, so thick indeed that only the highest peaks remained above its surface. At times during the Ice Age there were periods when the climate was warmer and the ice receded. Such periods are called Interglacial Periods.

During its greatest advance the Ice Sheet spread slowly southward until Ireland, Scotland, and England as far south as the Thames were buried beneath it. To the east, this sheet advanced from Scandinavia across the Great European Plain, stretching from the present mouth of the Rhine, eastward beyond the Vistula.

At the same time great glaciers descended from the Alps and travelled northward across the plain. But the Ice Sheet coming from the north and these glaciers advancing from the south did not meet, and between them remained a fertile strip of varying width not covered by ice. This belt spreads from Picardy, in France, across the south of the German Plain, and thence through Poland into Russia. Like the plains of Northern China, it is covered with a light sandy soil called *loess*, in all probability wind-borne, which forms a rich agricultural soil. When the Ice Sheet finally retreated it left behind clays, sands, and gravels, as well as rocks and boulders which had been carried by glaciers. Many of the latter, called erratics, or 'wanderers', are found in such regions as the British Isles north of the Thames, and the North German Plain.

Climate. Europe extends from latitude 70°N. to 35°N., and thus nearly the whole continent lies in the temperate zone, and in the *westerly variable wind belt*. Owing to (*a*) the many inlets and seas opening from the west, and (*b*) the absence of a north–south mountain barrier, the westerly winds carry the influence of the Atlantic a considerable distance inland, though this influence steadily diminishes towards the east, with increasing distance from the ocean.

The Mediterranean Lands, lying in lower and warmer latitudes, are isolated from the rest of Europe by mountains whose general

direction is from west to east. These mountains shelter the greater part of the Mediterranean region from cold influences from the north, but they do not prevent moderating oceanic influences reaching it from the south-west. In winter, however, cold north winds from Russia sometimes blow over the Aegean and Greece.

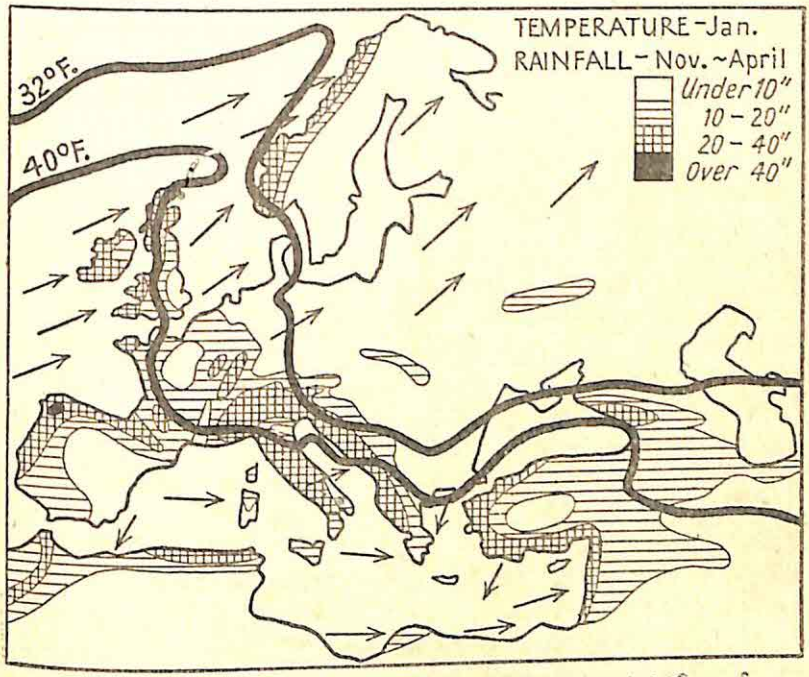


FIG. 69. Europe: Winter Temperature and Rainfall.

Temperature. In *winter* the waters of the Atlantic are comparatively warm, for they retain for a time the heat they have been steadily absorbing during the summer. In the northern winter, when the sun is overhead between the equator and the Tropic of Capricorn, the heat, wind, and rainfall belts shift south. At this season all Europe lies in the westerly variable wind belt. These winds waft the warm waters of the *North Atlantic Drift* across the northern part of that ocean, and the waters, by warming the winds blowing over them, raise the temperature of Western Europe, causing a mild winter climate (Fig. 69). *In winter, temperatures decrease from west to east.*

In *summer* the sun is overhead in the Northern Hemisphere. Its rays now shine down more directly in the south than in the north, and their power is therefore much greater in the former region. The ocean has not yet attained its maximum heat and is comparatively cool, and thus regions near the coast are cooler than those in the

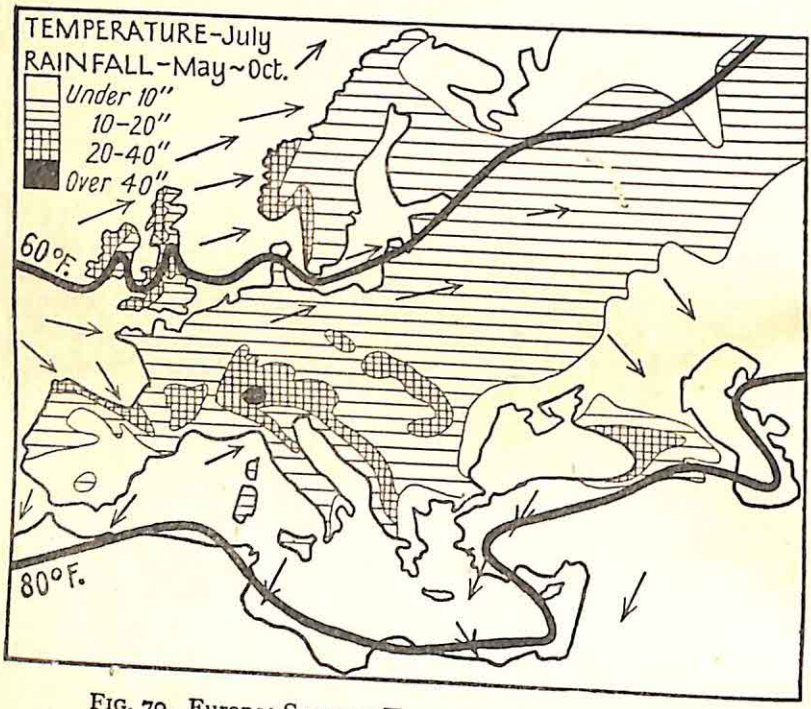


FIG. 70. Europe: Summer Temperatures and Rainfall.

interior where the oceanic influence is but little felt. *In summer, temperatures decrease from south to north,* and the isotherms run from south-west to north-east (Fig. 70).

Rainfall. In *winter*, as we have already seen, Europe lies in the westerly variable wind belt. The mountainous regions of the North-West are the wettest: South-West Norway, the west of Scotland, the English Lake District, the Welsh Uplands, and North-West Spain receive the heaviest rain. Central and Eastern Europe are comparatively dry.

In *summer* the prevailing winds in Western Europe still blow from

the west, bringing rain to the north-western part of the continent. As Central and Eastern Europe are regions of considerable heat and low pressure, the influence of the winds extends farther inland in

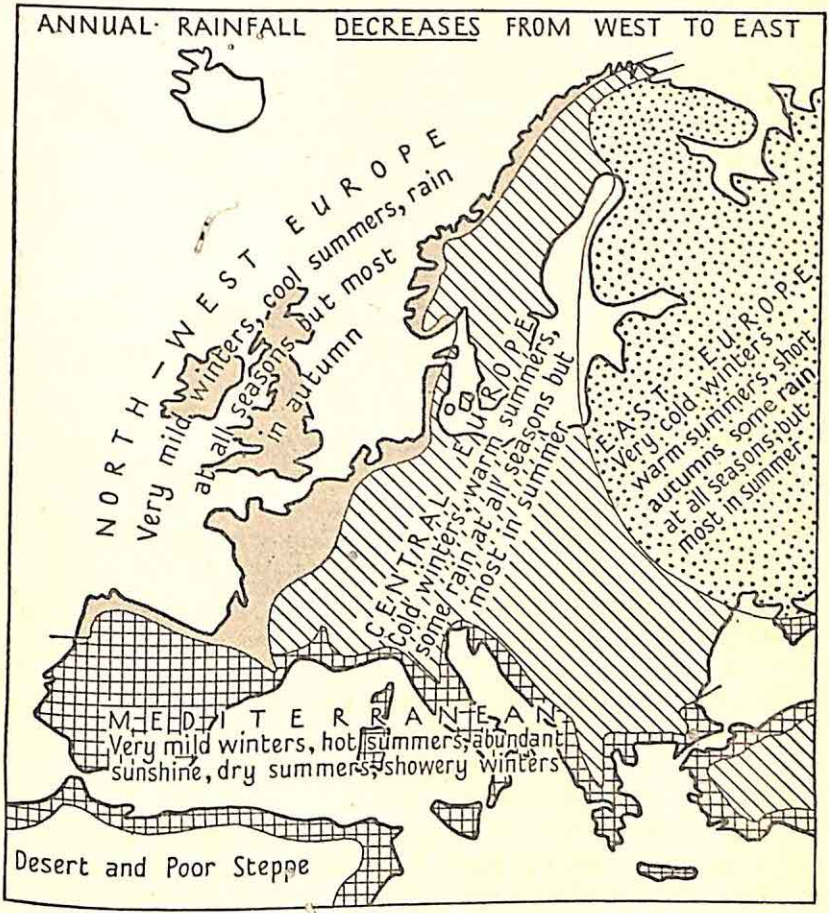


FIG. 71. Europe: Climatic belts (after Kendrew).

summer than in winter (when high-pressure conditions prevail). Thus most of the rain in Central and Eastern Europe falls in summer, when rainy periods alternate with hot dry spells.

But as the wind belts have moved north, with the apparent movements of the sun, the Mediterranean Lands now lie on the edge of

the North-East Trade Wind area. They are in the Dry Belt and receive little rain, though sometimes thunder-storms with heavy downpours occur.

It is important to note that *a considerable amount of the rainfall*, especially in Western Europe, *is brought by cyclones* (depressions) which usually move from west to east across the continent. They are more frequent in winter than summer.

Four climatic belts may be distinguished (Fig. 71).

(1) *North-Western Europe* (including the British Isles), which has cool summers, mild winters, and rain at all seasons, with an autumn maximum.

(2) *Central Europe*, which has warm summers, cold winters, and rain at all seasons, but most in summer.

(3) *Eastern Europe*, whose climate is somewhat similar, but more extreme than that of Central Europe: temperatures are higher in summer, lower in winter, while nearly all the rain falls during the summer.

(4) *The Mediterranean Lands*, where the summers are warm, dry, and brilliantly sunny, and the winters mild and showery.

Natural Vegetation and Crops. The kind of vegetation depends on the relief, soil, and climate; and of the climatic factors temperature and rainfall are the chief. Moreover, the sufficiency of rain in any region depends mainly on evaporation, though given favourable circumstances deficient rainfall can be remedied by irrigation.

With the exception of the Tundra, the natural vegetation zones of Europe have been greatly modified by Man (Fig. 72).

(1) The *Tundra* stretch from the higher parts of Scandinavia along the Arctic coast-lands of Russia.

(2) The *Cool Forests*, south of the Tundra, contain birch and coniferous trees like pine, larch, and spruce which are adapted to withstand the low rainfall and long severe winters. In the cleared areas rye, oats, barley, and roots are grown.

(3) The *Deciduous Forests* (with conifers at higher elevations) lie south of the Cold Forests. Beeches, oaks, and other broad-leafed trees found in these forests require rain at all seasons, and it is interesting to note that for this reason they are not found in the Mediterranean Lands owing to the summer droughts. The deciduous woodlands, which once covered the greater part of Western

and Central Europe, have now been extensively cleared for cultivation. Cereals include wheat and barley: among the chief roots are potatoes and sugar beet.

(4) The *Steppes* have hot summers, cold winters, and sufficient rainfall for grass (and cereals), but not for trees. The chief steppe areas, which are the leading wheat- and maize-growing districts in Europe, are in Southern Russia and the Hungarian Plain.

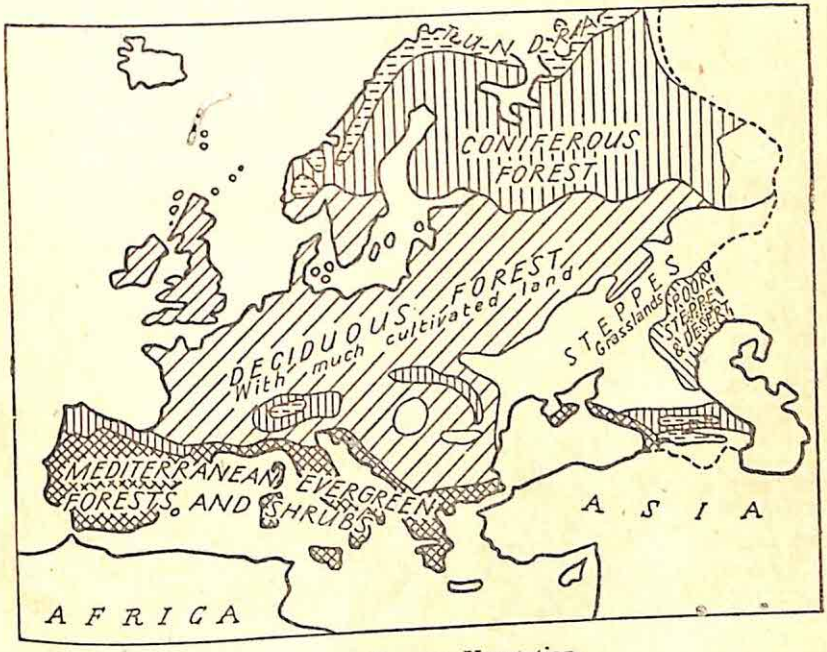


FIG. 72. Europe: Vegetation.

(5) In the *Evergreen Forests* of the Mediterranean Lands, trees and shrubs are adapted to withstand the dry summers. Characteristic products are the holm and cork oak, the olive, vine, orange, and lemon. Maize and wheat are the main cereals, while rice is grown in hot districts, on irrigated lands.

Distribution of Minerals. Europe has little gold, copper, tin, or silver, but it is rich in coal and iron which, outside the Mediterranean region, are fairly well distributed. Apart from the British coal-fields, the chief mining districts are found (Fig. 74) (i) along the northern

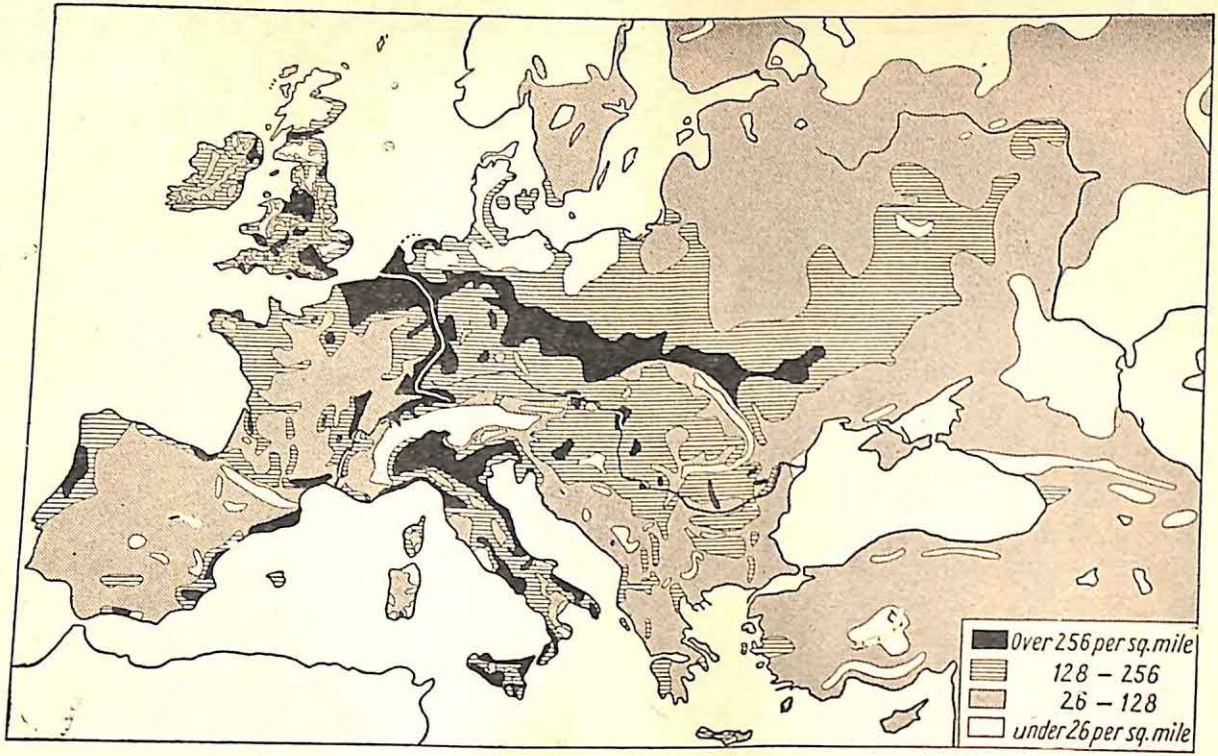


FIG. 73. Europe: Population.

edge of the Central Uplands, (ii) in Northern Spain, and (iii) in the Donetz Basin of Russia. France, the United Kingdom, Sweden, and Luxembourg are the principal iron ore producing countries. Petroleum is obtained from Rumania, Poland (Galicia), and is exported

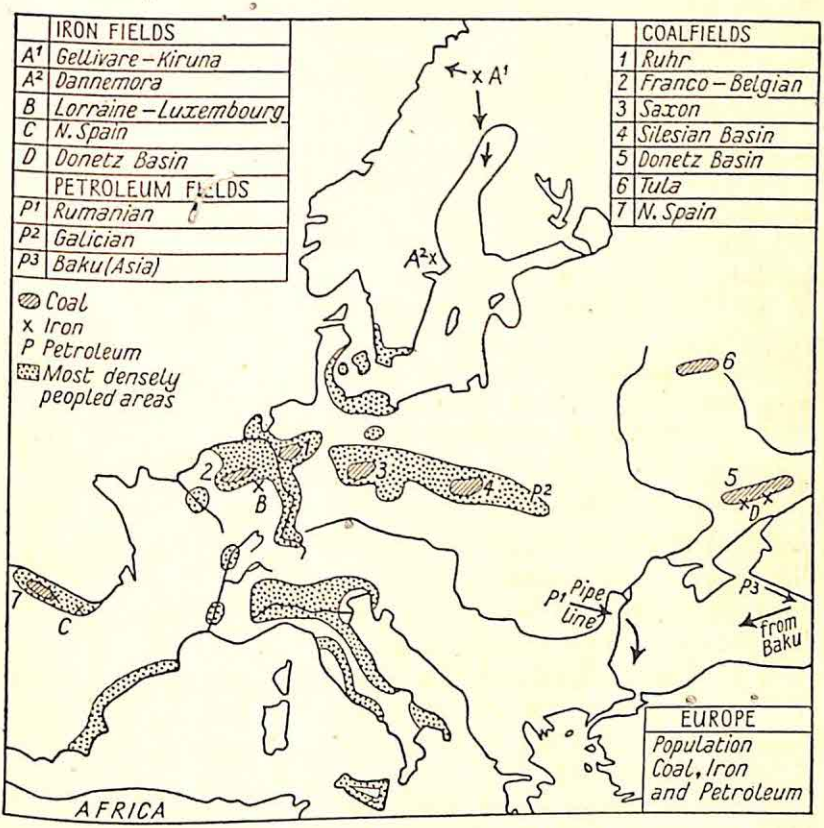


FIG. 74. Europe: Distribution of Minerals.

from Batum, the Black Sea port to which it is pumped through pipelines from Baku, on the Caspian.

Distribution of Population. As will be seen from Fig. 73, the most densely peopled areas in Europe (excluding Great Britain) are (i) the industrial areas, centred on the Franco-Belgian and German coal-fields; (ii) the coast-lands of Belgium and Holland; (iii) the Rhine

Valley; (iv) the North Italian Plain; and (v) most of the Mediterranean coast-lands of Spain, and those of Italy, including Sicily.

In addition to the mountain areas, sparsely peopled regions are (i) the Meseta; (ii) Central France; (iii) much of the Balkan Peninsula; (iv) Eastern Poland (Pripet Marshes); and (v) South-East Russia, and Northern Russia.

Communications. Europe, with her indented coast-line, is well placed for ocean trade. On the west she faces the Atlantic, the world's busiest ocean; on the south the Mediterranean, through which goes the seaway, via the Suez Canal, to India, the Far East, and Australia. Moreover Europe has a finer internal transport system than any other continent, facilities being best in the west but declining towards the east. From Paris important railways run (*a*) east through Berlin to Leningrad; (*b*) by the Orient Route via Budapest to Istanbul; (*c*) south-east by the Alps to Italy and the Mediterranean; and (*d*) south-west to Lisbon. The Rhine is the chief inland waterway, but much trade is carried on along the Danube, and by the canals in France, Belgium, Holland, and Germany. Regular air routes link the principal European cities with each other and with those in all other continents.

Political Divisions. The countries of Europe fall into four main divisions, based chiefly on climatic characteristics.

(1) Countries of Western Europe—the British Isles, France, Belgium, Holland, and Switzerland.

(2) The Baltic Lands and their margins—Denmark, Scandinavia (Norway and Sweden), the Baltic Republics, Russia, and Poland.

(3) Germany and the Danube Lands—Hungary, Yugoslavia, Bulgaria, and Rumania.

(4) Mediterranean Europe—the Iberian Peninsula (Spain and Portugal), Italy, Greece, and Turkey in Europe.

EXERCISES

1. Europe may be divided into four major physical divisions. (*a*) Name these divisions. (*b*) Describe the physical relief of *one* of them, illustrating your answer by a sketch-map.

2. Draw a map of the Mediterranean Sea. Shade the high land surrounding this sea. Show by arrows, and name (i) three land- and two water-routes leading to the Western Basin, and (ii) three land-routes and one water-route leading to the Eastern Basin.

3. What part of Europe, excluding the British Isles, was once covered by the Ice Sheet? What effect did the Ice Sheet have on the topography of the land and on the soils of the area it covered?

4. What do you mean by the term *continental shelf*? Off what part of Europe is the continental shelf broadest? What advantages has this given to this area?

5. On an outline map of Europe (*a*) insert the July isotherm 70°F., and the January isotherm 32°F. (*b*) Selecting appropriate phrases from the following, summarize on your map the summer and winter temperatures of the four temperature divisions into which the isotherms you have drawn divide Europe:

(i) *Cool Summers: Mild Winters;*
(ii) *Cool Summers: Cold Winters;*
(iii) *Warm Summers: Cold Winters;*
(iv) *Hot Summers: Mild Winters.*

6. (*a*) On a sketch-map mark and name the chief vegetation zones into which Europe may be divided. (*b*) Give a short account of the natural vegetation and crops in any *two* of them.

7. How do you account for the following facts: (*a*) Palm trees grow out-of-doors in the Isle of Man, but they are not found in similar latitudes in Eastern England; (*b*) Rice can be grown in the Plain of Lombardy, but olives cannot be cultivated there; (*d*) in France the vine is not grown north of the Loire Valley?

8. Europe may be divided into four major climatic divisions. (*a*) Name these divisions. (*b*) Each of the towns, for which climatic data are given below, is situated in one of the major divisions. State, giving your reasons, in which division you think each town lies.

		J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
A	Temp. °F.	15	17	24	36	48	59	64	61	51	40	29	20
	Rain, inches	0·9	0·8	0·9	0·9	1·7	1·8	2·7	2·7	2·0	1·7	1·4	1·2
B	Temp. °F.	52	56	60	64	70	78	85	85	78	68	60	53
	Rain, in.	2·6	2·0	2·6	1·8	1·7	0·6	0·0	0·1	0·8	2·1	3·1	2·5
C	Temp. °F.	41	43	47	53	58	64	68	68	64	55	47	41
	Rain, in.	2·5	2·0	2·3	2·5	2·8	2·8	1·9	2·0	2·6	3·6	3·1	2·7
D	Temp. °F.	31	33	37	46	55	62	65	63	57	48	38	33
	Rain, in.	1·5	1·3	1·7	1·4	2·0	2·0	3·1	2·2	1·8	1·8	1·6	1·7

9. Select *one* of the above towns in question 8 and represent the temperature and rainfall by means of a diagram.

CHAPTER XI

GENERAL SURVEY OF THE BRITISH ISLES

BEFORE the great discoveries of the sixteenth and seventeenth centuries the British Isles lay on the edge of the known world. They were an outpost of Europe, islands of no great importance, looking towards that continent from whence had come most of their peoples, their language, law, and religion. But after the discovery of America, Britain was no longer situated on the outskirts of the world, but at its centre, for now she lay athwart the ocean highway leading from the Old World to the New. Gradually she extended her sea-trade, and entered upon that colonizing policy which was so successful that at the present time the British territories overseas cover more than one-quarter of the land surface of the globe, and contain nearly one-fourth of its population.[1] 'For Britain the Age of Discovery may be said to have dawned in 1497, when Cabot's little ship, after weeks of buffeting by the Atlantic waves, reached Newfoundland, now her oldest Dominion. Since then exploration, conquest, and settlement have each played its part in adding to British territory the great regions of the Dominions, India, and the Colonial Empire.'[2]

Britain owes much to her maritime situation. To it is due that favourable climate which has played no small part in making her people active and vigorous; and that security, now threatened by the development of aircraft, which enabled her people for nearly 900 years to carry on their occupations with but little interference from the outside world. The situation of Britain on the continental shelf is a distinct advantage, for thanks to it the tidal wave increases in height, and twice each day wraps round the British Isles, turning many estuaries into navigable arms of the sea.

Moreover, the insular position of Britain, coupled with her excellent harbours, has played a great part in making her people a nation of sailors and fishermen.

But despite the growth of her sea-trade, Britain remained until the eighteenth century primarily an agricultural and stock-rearing country. Then, towards the middle of that century, the invention of

[1] See Appendix.

[2] 'Mapping the Empire across the World', by Jasper H. Stembridge, *Daily Telegraph*, 14 May 1937.

the steam engine and of power-driven machinery gave Britain the lead in the Industrial Revolution—a lead which, in spite of foreign competition, she has never wholly lost. One thing alone enabled her to take full advantage of the mechanical inventions of her people, and that was the presence of abundant supplies of *coal*, and it is to coal more than to any other geographical factor that Britain owes her economic development.

Relief. The surface of the British Isles has been greatly worn away by denudation. At the present time running water is the principal agent of erosion, but in past ages the Ice Sheet, which covered the region north of the Thames, did much to mould the surface of the land. The glaciers of the Ice Age played a great part in fashioning the U-shaped valleys now to be seen in parts of the Scottish Highlands, the Lake District, and the Welsh Uplands; while the narrow mountain lakes and sea-lochs which indent the north-west coast of Scotland were formed, in part at least, by glacial action. The Ice Sheet also left behind masses of waste material, such as the boulder clay, sands, and gravels.

In the British Isles there is little land over 3,000 feet. The north and west are chiefly uplands whose old, hard rocks form thin, infertile soils. The east and south are mainly lowlands, whose younger rocks have weathered to form fertile soils.

In Great Britain there are a number of well-marked physical divisions (Fig. 75). The *Scottish Highlands*, in the north, are the most extensive upland area in the British Isles. They form a dissected plateau, deeply trenched by valleys whose south-west to north-east direction is well seen in Glenmore, the narrow rift separating the North-West Highlands from the Grampians. The *Midland Valley of Scotland* is a broad rift valley lying between the Grampians and the *Southern Uplands*. In the south-east the latter merge into the Cheviots, beyond which high land continues to the Tyne Gap.

The *Pennines*, which project southward into England, may be divided into the Northern Pennines, extending from the Tyne to the Aire Gap, and the Southern Pennines, which stretch from the Aire Gap to the Peak District of Derbyshire. On the west, the Pennines are linked by Shap Fell with the dome-like *Cumbrian Mountains* of the Lake District.

The *Welsh Uplands*, a much denuded highland area, extend from

the narrow coastal plain of North Wales to the broader lowlands of Glamorgan. The *South-West Uplands of Devon and Cornwall* consist of Exmoor and the granite masses of Dartmoor and Bodmin Moor, separated by the valley of the Tamar.

The *English Plain*, the most extensive lowland area in Great Britain, may be divided into a number of regions.

(*a*) The *Midland Plain* of New Red Sandstone extends through the Midland Gate into Cheshire and Lancashire, and east of the Pennines into Yorkshire.

(*b*) The *Scarplands* stretch from Dorset to Yorkshire. They consist of roughly parallel oolitic limestone and chalk hills, between which lie clay vales. On the north-west the ridges fall by steep escarpments, but on the south-east they descend to the vales by long gentle dip-slopes. Follow the ridges on a map. The chief limestone ones are the Cotswolds, Northampton Heights, Lincoln Edge, and the North York Moors. The principal chalk ridges are the Western Downs, the White Horse Hills, the Chilterns, the East Anglian Heights, the Lincolnshire Wolds, and the Yorkshire Wolds. From the Western Downs, the North and South Downs run eastward.

(*c*) The *Fens* and *East Anglia*.

The downfolds forming (*d*) the *London Basin*, and (*e*) the *Hampshire Basin*.

(*f*) The *Weald* was formed by the erosion of a dome of chalk between the North and South Downs, which are now the only remaining portions of this former upfold.

Ireland consists of a Central Plain, floored with limestone, surrounded by detached uplands between which the lowlands reach the sea.

Rivers. Apart from the estuaries, whose importance can scarcely be overestimated, the rivers of Britain are of little use for navigation, and except for the Shannon and some Scottish and Welsh (in Snowdonia) streams few have been harnessed for hydro-electric power.

As most of the mountainous areas in Great Britain lie closer to the west coast than the east, the rivers flowing into the Atlantic and the Irish Sea are (except for the Severn) shorter than those running into the North Sea. Trace on a map the main watershed running from the north-west of Scotland to the centre of the Southern Uplands, and thence along the west side of the Pennines.

The Scottish Rivers. The Clyde (106 miles) is the only important river flowing westward to the sea. On the east the chief streams

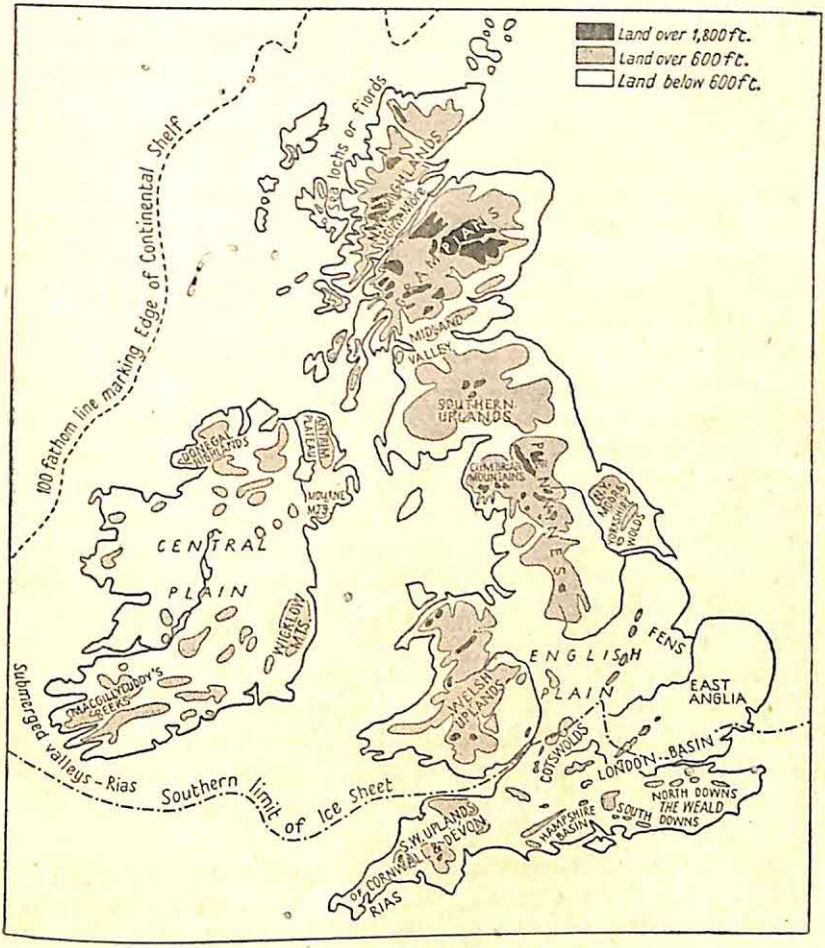


FIG. 75. British Isles: Physical features.

entering the North Sea are the Spey (96 miles), Dee (87 miles), Tay (100 miles), Forth (60 miles), and Tweed (96 miles).

The Pennine Divide. From the Northern Pennines, the Eden (draining Lakes Haweswater and Ullswater), Lune, Ribble, and Mersey flow into the Irish Sea. The Trent (150 miles) also rises on

the west side of the Pennines, but curves round their southern end, turns east, and enters the Humber. The Yorkshire Ouse (120 miles), which also enters the Humber estuary, gathers tributaries from the eastern slopes of the Pennines. Of these the Aire has eaten back its way through the Uplands to form the *Aire Gap*, which, like the *Tyne Gap* to the north, is an important channel of communication. The Tyne, Wear, and Tees flow in an easterly direction from the Pennines to the North Sea.

The *Rivers of the Scarplands* include the Great Ouse (145 miles), Nen, Welland, and Witham. After leaving the Scarplands, the Thames (215 miles) traverses the London Basin, flowing into the North Sea through a wide estuary.

The *Rivers of the South-West* include the Parret, Exe, and Tamar whose 'drowned' valley (a ria) forms Plymouth Sound.

Rivers of the South-East. On your map, follow the watershed of South-East England through the White Horse and Hampshire Downs, and thence through the Forest Ridge of the Weald. Among the streams flowing into the English Channel are the Salisbury Avon; the Test and the Itchen both entering Southampton Water; and the Arun and Sussex Ouse, flowing through gaps in the South Downs. Through similar gaps in the North Downs the Stour flows into the North Sea, the Medway into the Thames estuary, and the Wey to the Thames.

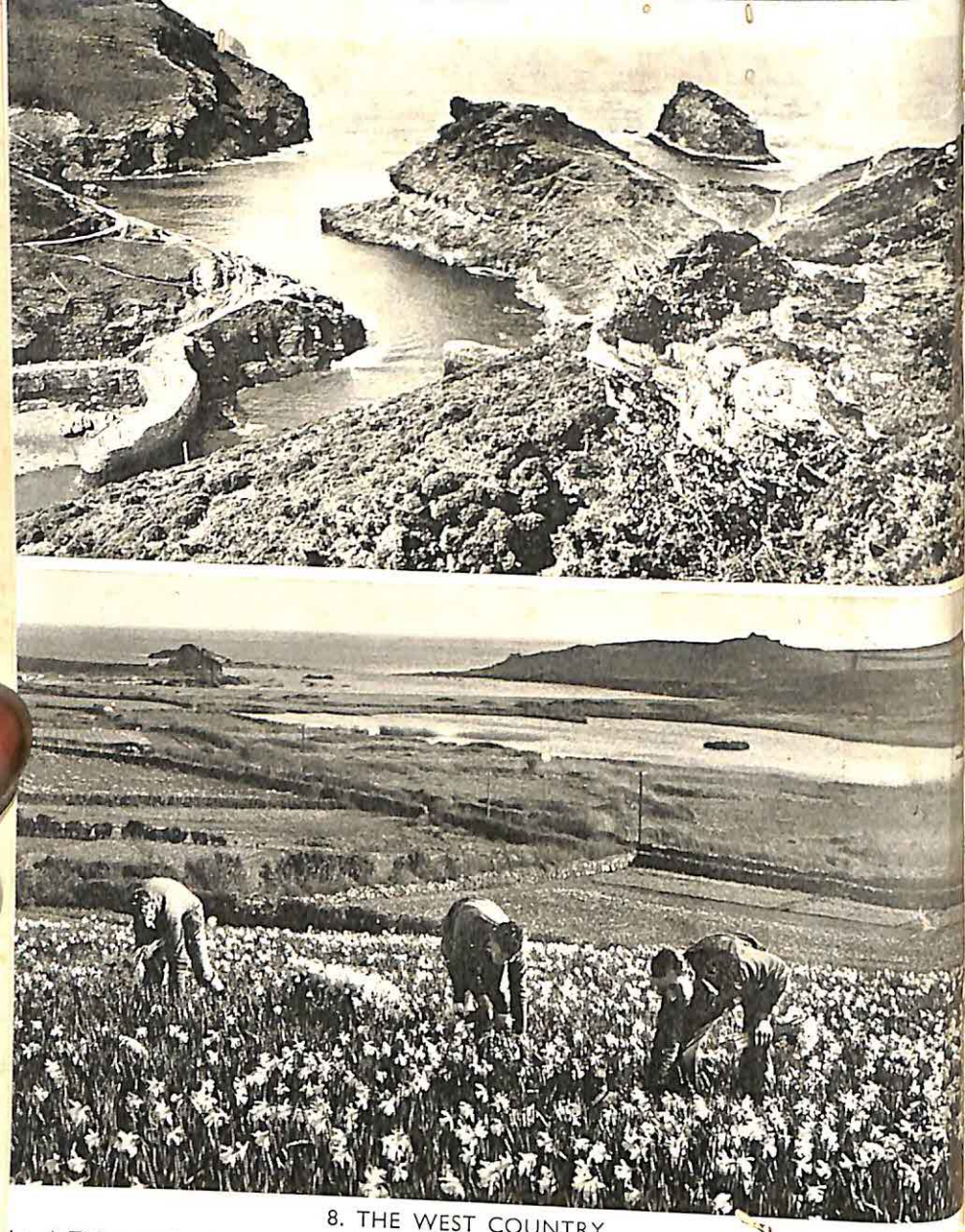
The Welsh Watershed. From the Welsh Uplands the Dee flows into the Irish Sea, the Severn (220 miles) and the Wye into the Bristol Channel. To the west of the lower Wye other streams—the Usk, Taff, and Tawe—flow into the Bristol Channel. They are mainly important because (i) Newport, Cardiff, and Swansea stand at their respective mouths, and (ii) their valleys form routes leading to the South Wales coal-field.

Irish Rivers. The Shannon (250 miles), the longest river in the British Isles, flows sluggishly across the Plain, but after leaving Lough Derg descends so rapidly to the sea that its waters are used for hydro-electric power.

Climate. On the west the British Isles face the Atlantic: on the east they front the North Sea. The prevailing *south-west winds* cause a surface drift of warm water to flow across the North Atlantic towards the British Isles. This water increases the temperature of the winds blowing over it, and thus allows them to absorb more

7. TRADITIONAL OCCUPATIONS

(Above) When the hops have been dried in these Kentish oast-houses they are sent to the hop market ready for the breweries. At the beginning of September whole families migrate from London to help gather the hops which may be seen on the right (see p. 129). (*Below*) Scottish fishermen are packing herrings into boxes ready to be dispatched by fast 'fish-trains'. Some of the herrings are cured for bloaters and kippers. Others are salted and packed in barrels for export (see also pp. 171 and 173).



8. THE WEST COUNTRY

bove) This stretch of coast at Boscastle, with the rock stack on the right, is typical of Corn
all and Devon. Fishing is naturally a traditional occupation, but the mild climate of South-
'est England, like that of the Scilly Islands (*below*), favours the production of early flowers,
uits, and vegetables which find a ready market in London and other populous centres. The
men we see here are gathering daffodils (see p. 140).

moisture than would otherwise be the case. To these warm, moisture-laden south-west winds is due, in large measure, the equable climate of the British Isles.

Temperature. *In summer the main factor affecting the temperature of the British Isles is the greater directness of the sun's rays in the south compared with the north.* The secondary factor is the influence of the ocean. In July, as the Atlantic is comparatively cool, the south-

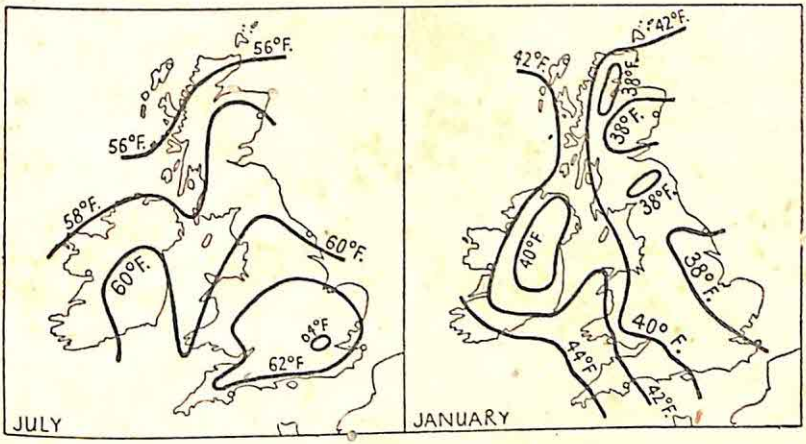


FIG. 76. British Isles: Temperature.

west winds, which are cool too, decrease the temperature of the coastal regions. On the other hand, the shallow North Sea is warmed more quickly than the deep Atlantic, and though it has a slight cooling effect on the land, this effect is not so great as that of the ocean on the west. *In summer, temperatures decrease from south to north, but the regions near the coast are cooler than those inland.*

In winter the sun is still higher in the sky in the south than in the north, but as it is overhead in the Southern Hemisphere its rays have little warming effect on the British Isles. The *primary factor affecting the winter temperature of the British Isles is the influence of the ocean.* In January the land has lost its summer warmth, but the ocean still retains some of its heat. At this season the warmer regions are those facing the Atlantic. This ocean is warmer than the North Sea, which, owing to its relative smallness and shallowness, loses its heat comparatively quickly. In winter the interior of Europe is very cold, and a region of high pressure. Easterly winds blowing

from this high pressure system have a distinct cooling effect on the east of the British Isles. In January South-East England, the nearest

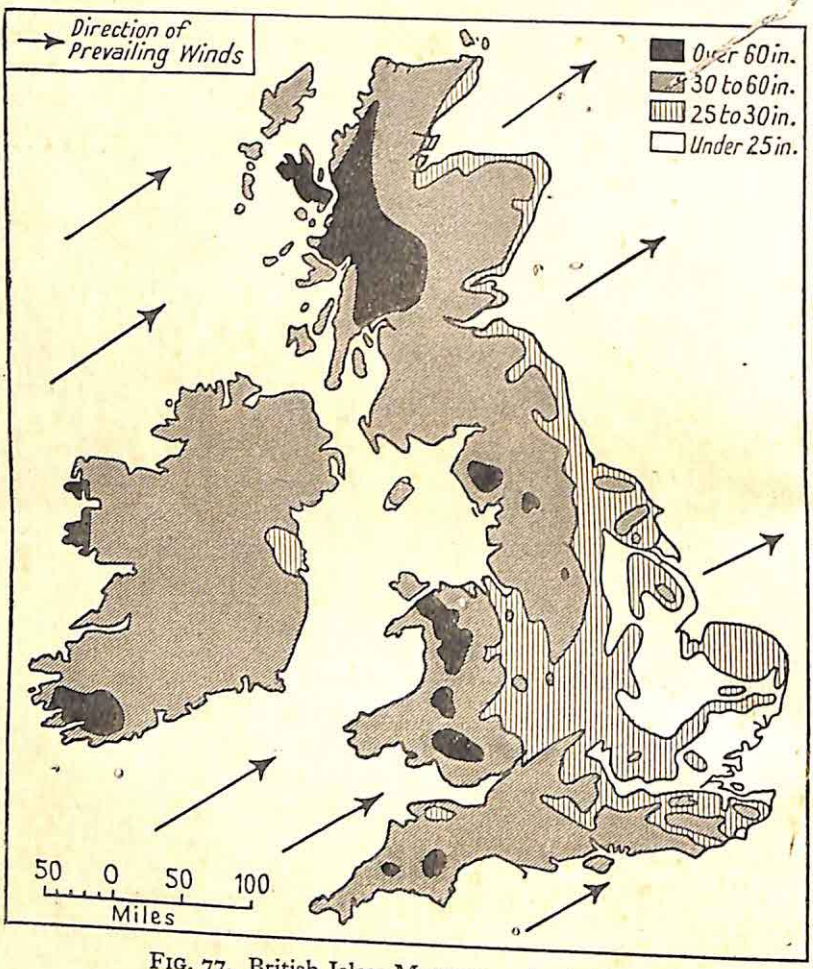


FIG. 77. British Isles: Mean annual rainfall.

point of which is only 20 miles from the Continent, is cooler than North-West Scotland, where the warming influence of the Atlantic prevails. *In winter the west of the British Isles is warm, the east is cold. Temperatures decrease from west to east, and therefore the isotherms run from north to south.*

Rainfall. (Fig. 77.) The prevailing south-westerly winds cause heavy rain in the mountainous west of the British Isles. When these winds descend on the leeward side of the uplands they have already lost much of their moisture and are comparatively dry winds. In

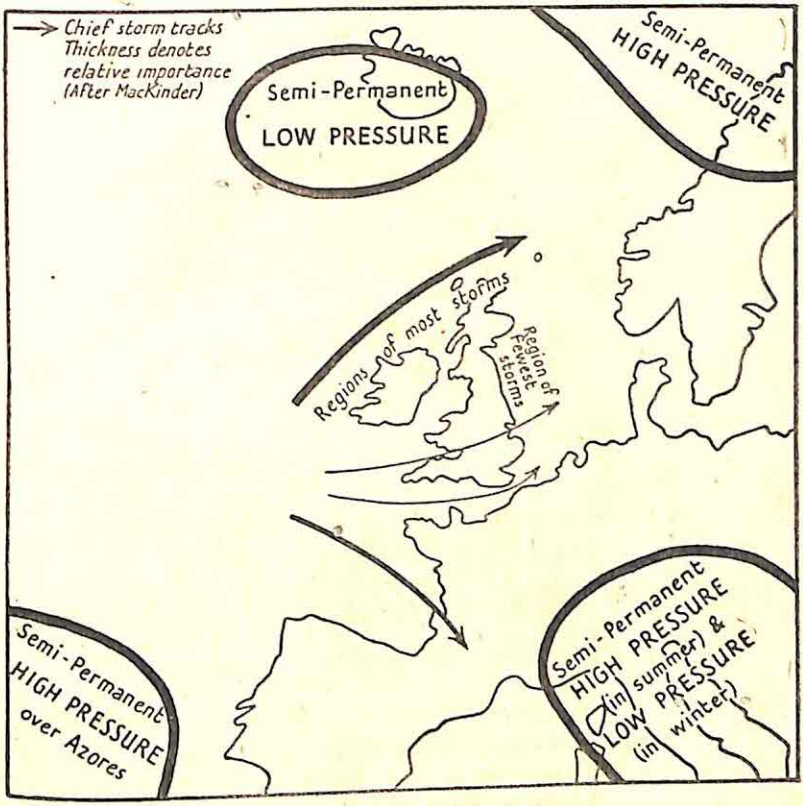


FIG. 78. British Isles: Weather.

their descent they are also warmed somewhat, with the result that they are (i) mild winds, and (ii) being warm retain more moisture than cool winds. Thus on the leeward side of the mountains there is usually a pronounced *Rain Shadow*.

The highest parts of the British Isles are the wettest parts: North-West Scotland, the Lake District, the Welsh Mountains, the uplands of South-West England, and South-West Ireland are the regions of most rainfall. Ben Nevis has a mean annual rainfall of 171 inches;

while Snowdonia, with 200 inches, is one of the wettest areas in Europe.

The east winds, blowing over the narrow North Sea, gather less moisture than the westerlies. Eastern England is flat, but even low hills receive greater rainfall than the valleys. The mean annual rainfall at both Nottingham and Cambridge is only 22 inches.

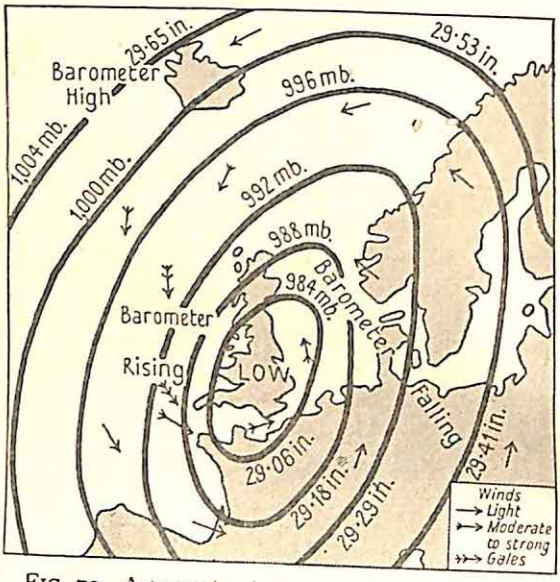


FIG. 79. A typical cylone over the British Isles.

Weather: *Climate is average weather.* The weather in the British Isles is affected mainly by *cyclones* which usually approach from the North Atlantic. To a lesser degree British weather is influenced by *anticyclones.* Both are represented on maps by *isobars.* Favourite tracks of cyclones are (i) along the north-west of our islands; (ii) up the English Channel; and (iii) across the south of England (Fig. 78). Cyclones usually come in series, being most intense and frequent in autumn and winter. The winds blow spirally inwards in a counter-clockwise direction to the low-pressure area in the centre, where, as the rising air is cooled on ascending, moisture is condensed and rain falls. In cyclonic periods the general weather conditions are unsettled and winds are variable (Fig. 79).

It is only in *anticyclonic periods* that the weather is really settled.

As can be seen from Fig. 80, the air flows outwards from the high-pressure area in the centre: as it is compressed and warmed in descending it is relatively dry, and the weather is fine. In summer the days are sunny, there is an absence of cloud, and temperatures are high. In winter, the days are cold and bright, the nights clear, frosty, and starlit. In winter, cold heavy air tends to collect in the

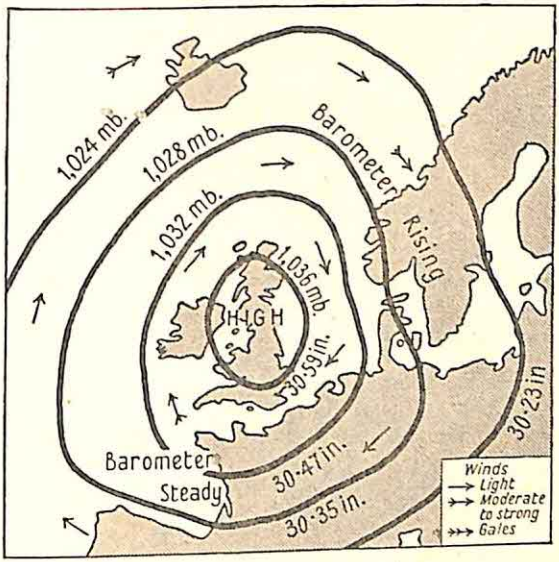


FIG. 80. A typical anticyclone.

valleys, where it is scarcely stirred by the light anticyclonic winds. Thus in such lowland regions the moisture from the damp ground is often precipitated as fog, and it is no uncommon thing to find brilliant sunshine on the hills while the valleys are fog-bound.

Climatic Zones.[1] The July isotherm 60° F. and the January isotherm 40° F. divide the British Isles into four climatic zones (Fig. 81).

(1) *The North-West*, where oceanic influences are greatest, has cool summers, mild winters, and heavy rain.

(2) In *the South-West* the summers are warm, the winters mild, and the rainfall moderate. This region has the most equable climate in the British Isles.

[1] After Mackinder.

(3) *The South-East* has warm summers, cold winters, a low rainfall, and the general climatic conditions are relatively extreme.

(4) In *the North-East* the summers are cool, the winters cold, but

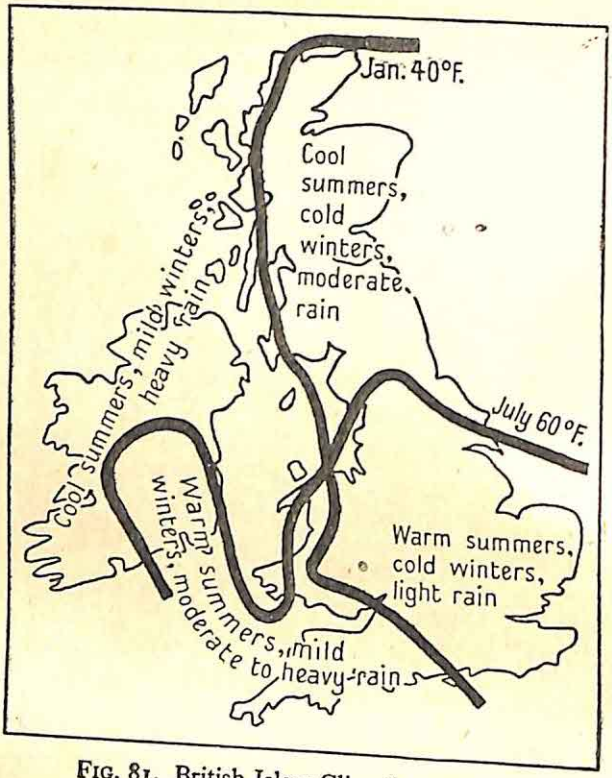


FIG. 81. British Isles: Climatic zones.

the rainfall is slightly more and the climate is somewhat less extreme than in the south-east.

Natural Vegetation. At one time the greater part of the British Isles was covered with deciduous forests and only the higher and more exposed parts were devoid of trees. Most of these forests have been felled for fuel and timber, cleared for pasture and agriculture, or for roads, towns, and villages. Trees like oaks and elms do well on clay soils, where their long spreading roots collect the water lying near the surface. Other broad-leafed trees, like beeches, thrive

on light, shallow soils, such as chalks, sands, and gravels; in limestone districts, like Derbyshire, one of the commonest trees is the ash.

The Weald, parts of Nottinghamshire and Staffordshire, and the

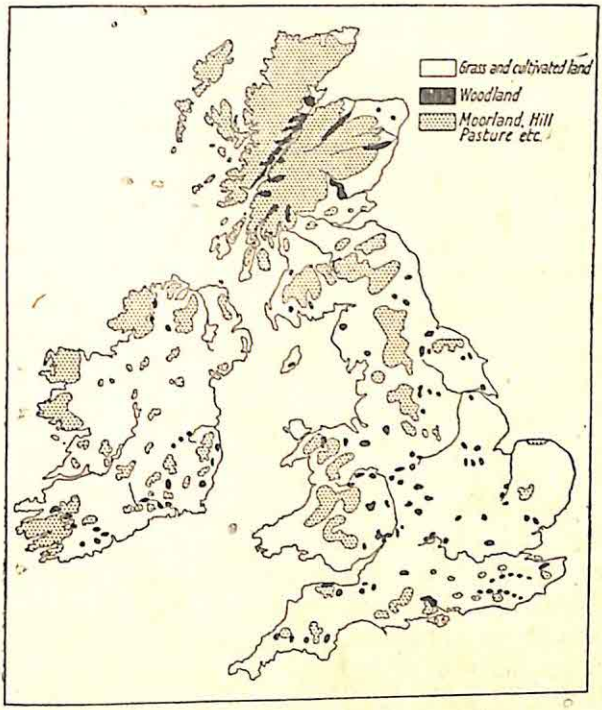


FIG. 82. British Isles: Natural vegetation.

Highlands of Scotland (Perthshire, Aberdeenshire, and Ross) are among the most thickly wooded regions at the present day. Much timber was cut down during the Great War, but the Forestry Commission has taken over some of the land unsuitable for farming and is planting from 25,000 to 30,000 acres per year chiefly with coniferous trees. Pines, which do well on sandy soils, grow more quickly than oaks and other deciduous trees, and consequently have a greater economic value.

Much of Ireland is covered with pasture, heather-clad moors, and peat bogs; and the amount of woodland is relatively small.

Agriculture. Up to the early part of the last century the British Isles were exporters of foodstuffs. To-day about 80 per cent. of our food is imported, and no other great nation is so dependent on overseas food supplies as the United Kingdom. Yet agriculture is Britain's second most important industry: out of every 100 people gainfully employed, 7 work on the land.

Country	*Land Utilization (Percentage)*				
	Mainly uncultivated	*Rough pasture*	*Permanent pasture*	*Arable land*	*Woods*
England	12	11	46	26	5
Wales	8	34	42	12	4
Scotland	20	52	8	15	5
Northern Ireland	10	16	55	18	1
Irish Free State	30·8		58	10	1·2

The greater part of the upland areas over 1,500 feet is covered with moorland and heath which, at the best, only provide rough pasture for sheep. The above table shows that in the British Isles as a whole there is considerably more pasture than agricultural land. This means that stock-rearing (mainly sheep and cattle) is more important than the production of cereals and other crops. Grass for pasture and hay grows best in regions with the greatest rainfall, though even in the drier districts there is in many river valleys much rich meadow land. The greatest acreage of arable land is found in the lowland districts of the drier, sunnier east of Great Britain.

Cattle. In the west of England and in Ireland many cattle are grazed, being in many areas reared mainly for milk. Cheshire, Lancashire, Staffordshire, and Derbyshire, in the heart of thickly peopled regions, are the leading milk-producing counties in Great Britain. The lush grasslands of the Plain of Gwent in South Wales may almost be regarded as one huge dairy farm, for nearly every farmer is engaged in milk-production for the neighbouring industrial regions. Considerable numbers of milch cows are also grazed in Essex owing to its proximity to London.

In Ireland much milk is made into butter.

Sheep. In the Middle Ages wool was England's staple export: to-day, in spite of the fact that there are 29,000,000 sheep in the British Isles, it is one of our leading imports among raw materials required for textile industries. Sheep are mainly bred on the upland areas such

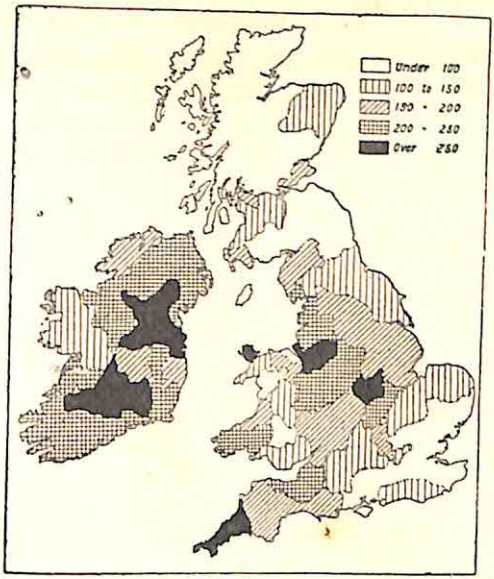


FIG. 83. British Isles: Distribution of Cattle (number per 1,000 acres).

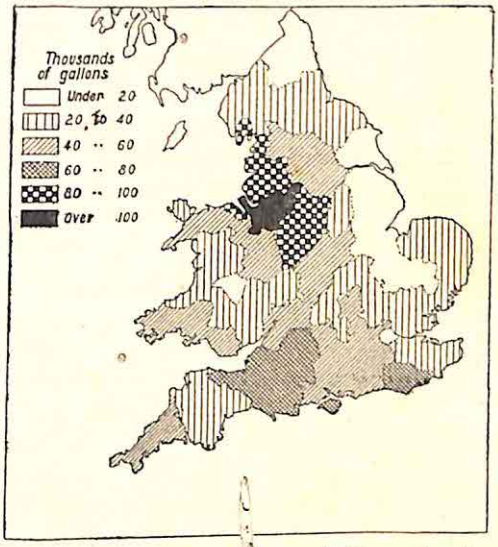


FIG. 84. England and Wales: Milk production by counties.

as the Welsh Mountains, the Southern Uplands of Scotland, and the English chalklands. Those reared on the short, sweet grass of the chalk downs produce the finest wool: those fed on the western uplands yield the best mutton.

Pigs. Of the 6,000,000 pigs in the British Isles nearly three-

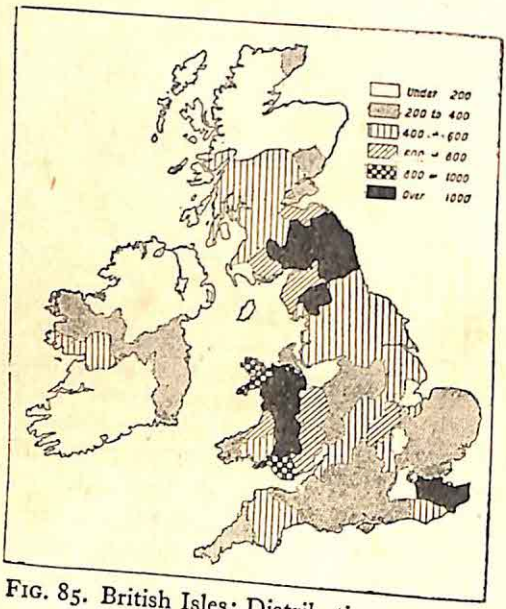


FIG. 85. British Isles: Distribution of sheep (number per 1,000 acres).

quarters are found in England and Wales. Pigs consume skim milk and unmarketable potatoes. Thus they are reared on nearly every Irish farm, where potatoes and milk are staple productions. In England large numbers are bred in the milk-producing areas such as Cheshire, and in the potato-growing counties, like Lincolnshire, the Isle of Ely, and Suffolk. Considerable numbers are found in districts round London, probably on account of their proximity to this populous area, and also because the by-products of London's mills and breweries provide valuable foodstuffs.

Poultry. The introduction of scientific methods of breeding and improved general management have resulted in a great increase in poultry in recent years and also in an increased output of eggs per

hen, which was 20 per cent. higher in 1934 than in 1924. There are poultry farms in all parts of the British Isles, especially in the purely agricultural districts or those near populous centres.

Wheat. Most of the wheat in the British Isles is grown in Eastern England, notably in the areas lying between the Thames and the Humber, where the clayey-loam soil, the dry sunny summers, the moderate rainfall, and the cold winters, which kill pests in the soil,

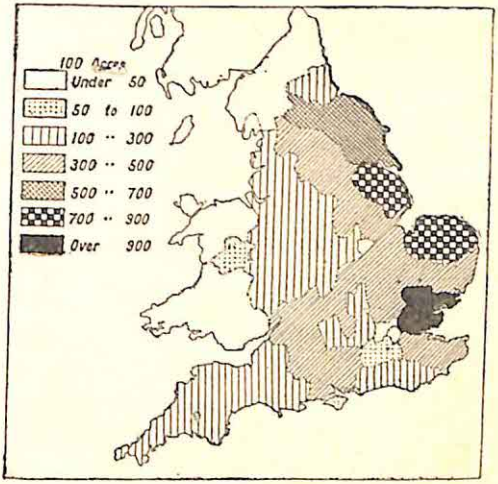


FIG. 86. England and Wales: Distribution of Wheat.

provide ideal conditions for this crop. Moreover, the level land allows the use of machinery for ploughing, sowing, and harvesting. Thus Essex has over 90,000 acres under wheat.

Barley. The best barley-growing lands are also found in Eastern England, especially on the light chalk and sandy soils of Norfolk and Suffolk. Barley is grown mainly for the production of malt, which is used in the brewing of beer and the distilling of whisky.

Oats are more widely spread than any other cereal, for they thrive equally well in dry areas and in cool wet districts unsuitable for wheat. In England they are grown chiefly in the east; in Scotland in the Eastern Lowlands; and in Ireland in the north-east.

Potatoes are grown in all parts of the British Isles, but some of the heaviest yields are obtained from the alluvial lands of the English Fens.

Other root crops, such as *mangolds*, *turnips*, and *swedes*, are widely distributed, but swedes do best on light soils, in the cooler,

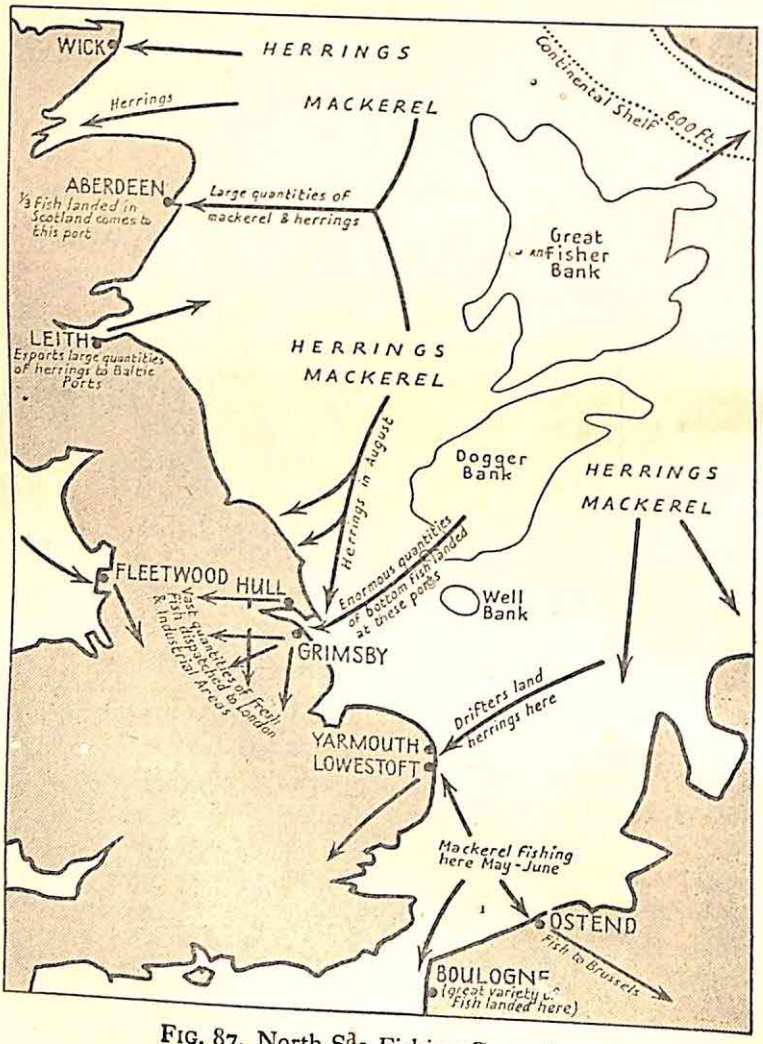


FIG. 87. North Sea Fishing Grounds.

damper climate of the north and west; while mangolds thrive in the warmer, drier lands of the Midlands and South-East England. Mangolds are a cattle food, but turnips and swedes are more suitable

for sheep. Thus in Cheshire, where there are more cattle than sheep, there is a larger acreage of mangolds than, for example, in Northumberland, where there are more sheep than cattle.

Sugar-beet. There has been an increase in the acreage under sugar-beet in recent years, though the British Isles produce little sugar-beet compared with many other countries. The chief counties where it is grown are Norfolk, Suffolk, Lincolnshire, the Isle of Ely, and Shropshire.

Hops need rich soils and ample sunshine. The chief hop-growing districts are Kent, Sussex, Herefordshire, and Worcestershire.

Fruit. Kent is the leading fruit-growing area in the British Isles, producing apples and plums as well as soft fruits such as gooseberries, raspberries, and strawberries. Parts of Cambridgeshire, Essex, the Vale of Evesham, Cheshire, Yorkshire, and the Carse of Gowrie in Scotland are other noted fruit-producing areas. Herefordshire and Gloucestershire, Devon and Somerset are celebrated for their cider apples.

Market Gardening. Throughout the British Isles market gardening is carried on in the proximity of cities and large towns, which provide a market for vegetable produce. But Cornwall, Devon, and the Scilly Isles, though remote from large centres of population, are, on account of their mild spring weather, famous for their early vegetables and flowers; while East Anglia and the Fen districts are one of our most important vegetable-growing areas.

Fisheries. The shallow seas, notably the North Sea, covering the continental shelf around the British Isles, are rich in green plants and tiny organisms, called plankton, which abound in the upper layers of the waters. These, together with debris brought down by rivers, provide valuable food for fish. Fishing is the sixth most important industry in the United Kingdom, which is, moreover, the chief country in Europe both for the import and export of fish.

Demersal or deep-sea fish, which live on or near the bottom of shallow seas, include haddock, sole, plaice, cod, and halibut. Among the chief *pelagic*, or surface-swimming, fish found in the seas around the British Isles are herrrings, mackerel, and pilchards. Deep-sea fish are caught by trawlers; surface-swimming fish by drifters. Trawlers, which go much farther afield than drifters, supply some 85 per cent. of the fish consumed in Britain.

Grimsby and Hull, the two largest fishing ports, send trawlers to the Dogger, Well, and Great Fisher Banks in the North Sea; to the Irish Sea and English Channel; to the waters round the Faroes, Iceland, Greenland, and Bear Island, which lies within the Arctic Circle; those off the Murmansk coast of Russia, and to the White Sea. Fleetwood, our fourth fishing port, and Milford Haven send boats to fish for hake off the north of Ireland and west of Scotland, as well as to the North Atlantic fishing grounds.

The North Sea abounds in herrings. Herring fishing begins off the west coast of Scotland in May, when Stornoway, in the Outer Hebrides, is the centre of the drifters. From July until September fish are caught in succession off Lerwick, Wick, Fraserburgh, Peterhead, and Aberdeen. In September the fish appear off the Yorkshire coast; then from October to December Yarmouth, the premier British herring port, and her neighbour Lowestoft become centres of the fishery. The season finishes towards the end of December, when many vessels depart for the waters round Cornwall, Devon, and Ireland, where mackerel fishing is carried on from February to May.

More than 80 per cent. of the British herring catch is exported. Barrels of salted herrings are sent chiefly to Germany, Poland, Russia, and the smaller Baltic States, and smoked herrings are dispatched to the Mediterranean countries.

Minerals. *Coal.* The British Isles produce 21 per cent. of the world's coal, ranking second only to the United States. Coal yields 88 per cent. of the value of all minerals produced in these islands. It provides the energy that drives the machinery in our mills, factories, and ships, it yields fuel for blast furnaces, gas-works, and thermal stations where electricity is generated. It is also by far the most important of our exports. No other country possesses so many kinds of coal as Great Britain, and from one field or another can be obtained coal for every domestic, commercial, and industrial purpose.

We may divide British coal-fields into two groups: (i) the inland fields, providing coal mainly for home industries and domestic purposes; and (ii) those lying near the coast where the coal is mined chiefly for export and local industries.

The *inland group* includes the *Lanark coal-field*, from which nearly half the coal in Scotland is obtained; the *York–Derby–Nottingham* field, whose output is the largest in the British Isles, and from which

some coal is also exported via the Humber ports; the *South Lancashire* field; the *North and South Staffordshire* fields; the *North Wales*

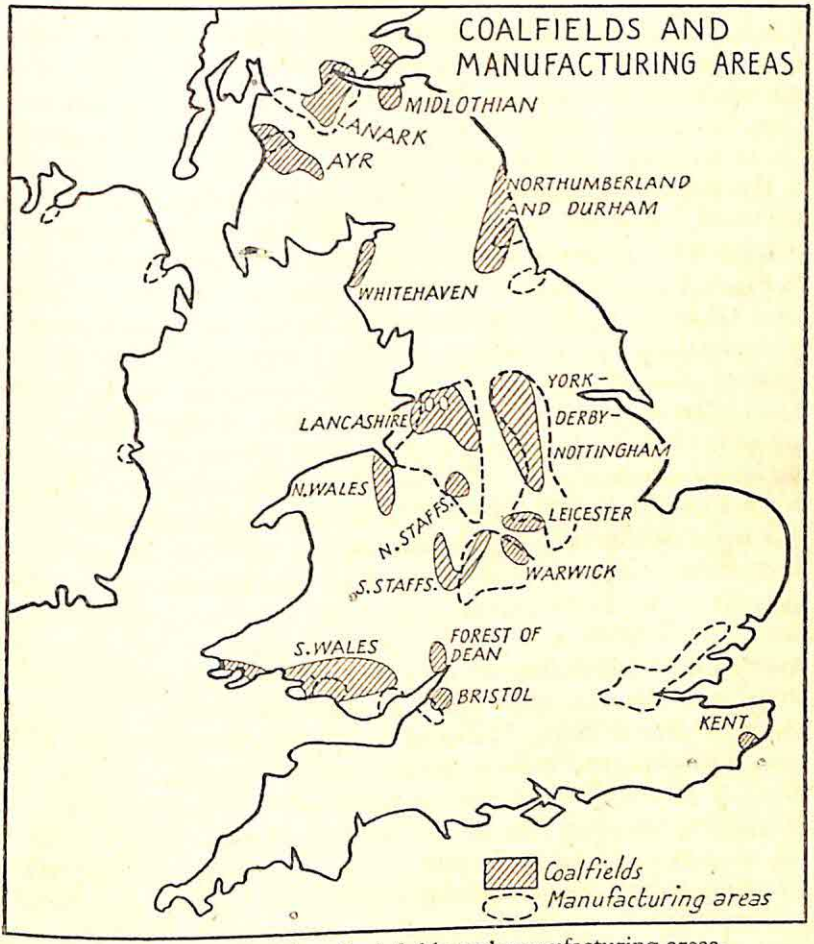


FIG. 88. British Isles: Coal-fields and manufacturing areas.

field; the Midland fields of *Leicestershire*, *Tamworth*, and *Warwickshire*; and the small *Forest of Dean* and *Bristol* fields.

The *exporting group* includes the *Ayrshire*, *Fifeshire*, and *Lothian* fields of the Midland Valley of Scotland; the small *Whitehaven* field; the *Northumberland and Durham* field; and the great *South*

Wales coal basin, whose anthracite and smokeless coal are in much demand throughout the world.

Iron ore ranks second to coal as the most important mineral in the British Isles, though actually its value is only some 3 per cent. of the total value of mineral output. Fortunately for British iron and steel industries, iron ores are usually found within easy reach of the coal-fields. An added advantage is the presence of limestone, used as a flux in smelting. Most of our iron ores are obtained from the belt of limestone hills running from the Cotswolds to the Cleveland Moors of Yorkshire. The Cleveland district, the Furness district of Lancashire, parts of Lincolnshire (Scunthorpe), Oxfordshire, and Northamptonshire (Wellingborough, Corby) are all noted for their ores. Great Britain imports some 40 per cent. of her iron ore, mainly from Northern Spain, Sweden, and North Africa.

Other minerals include *lead*, mined in the district east of Snowdonia, Cornwall, and the Isle of Man. *Tin* and *copper* have been mined in Cornwall from early times, but the present output is small.

Non-metallic minerals. Mines are only found in certain districts in the British Isles: more common are the quarries, gravel and clay pits from which most of our non-metallic minerals are obtained. Sedimentary rocks are easily quarried and worked, and of these the majority of sandstones, grits, and limestones form good building materials. Sandstone is widely used as a building stone in areas where it is found, such as the New Red Sandstone Plain of the Midlands, and the Malvern Hills (Old Red Sandstone). The hard, coarse sandstone, called Millstone Grit, provides excellent material both for millstones, as its name implies, and grindstones; while in localities where it occurs, such as the Southern Pennines, it is used for paving purposes. In limestone districts, like the Cotswolds, the churches and older houses are usually built of local stone. In addition to its use for smelting iron ore, limestone is also used for making cement, and when 'roasted' for fertilizing the land. Granite and other igneous rocks are difficult to work. As a rule, they are extremely heavy and are only used for ordinary building purposes in places where they are quarried, such as round Aberdeen, Dartmoor, and the Mourne Mountains in Ireland. Granite and basalt, another igneous rock, are widely used for road-making.

In the course of ages granite may decompose to form kaolin, or china clay, used for making pottery, which is mainly obtained from

Cornwall and Devon. Slate, another metamorphic rock, is one of our most useful roofing materials. There are important quarries at Llanberis, Bethesda, and Penrhyn in North Wales, and in Cornwall; from Borrowdale in the Lake District green slates are obtained.

There are valuable deposits of rock salt in Cheshire and South-East Durham. Common salt plays an important part in many

FIG. 89.

Fig. 90.

chemical industries, and between the salt-producing region of Cheshire and the South Lancashire coal-field are situated many towns engaged in chemical manufactures. From the oil-shales found in parts of the Midland Valley of Scotland paraffin oil is distilled. To-day the output is small. Near Stockton-on-Tees, works are in operation for the hydrogenation of coal, whereby petrol is obtained.

Overseas Trade. Fig. 89 shows that our chief imports are (i) foodstuffs, and (ii) raw materials required for manufactures. Our principal exports (Fig. 90) are (i) manufactured articles, of which cotton goods are the chief; (ii) coal,[1] the main raw material we export, which provides a valuable return cargo in exchange for bulky imports such as foodstuffs; and (iii) re-exports, most of which are obtained from the British Empire, and dispatched to other countries

[1] See note at end of this chapter.

from entrepôt ports, such as London. Chief among these re-exports are rubber and tin from Malaya; wool from Australia, South Africa, and New Zealand; tea from India and Ceylon, and hides from India and Africa. Our imports are of far greater value than our exports,

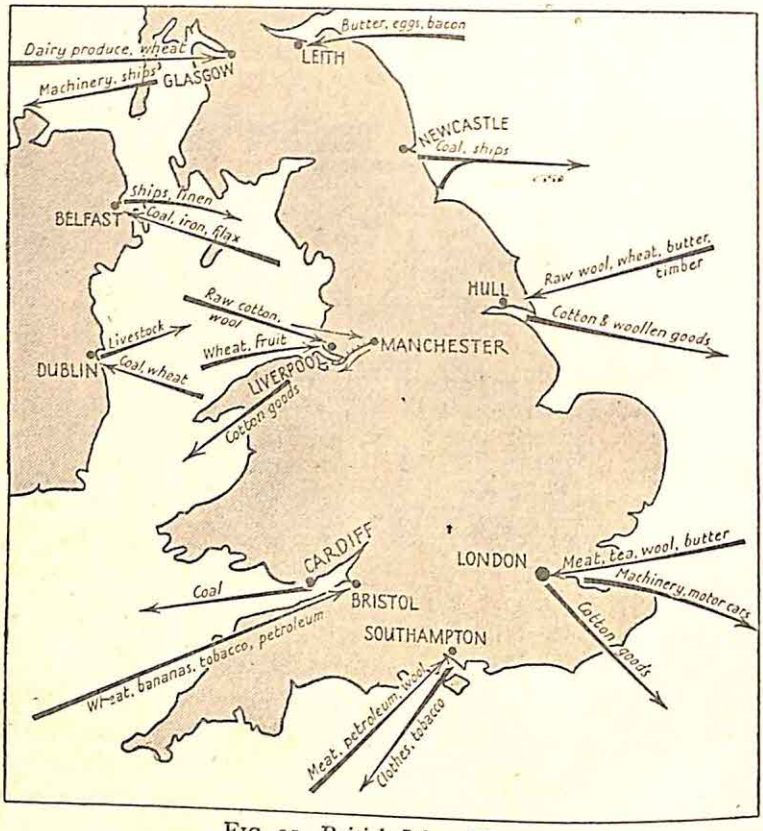


FIG. 91. British Isles: Trade.

but what would be otherwise an adverse trade balance is remedied by our invisible exports, i.e. profits derived mainly from our shipping and investments overseas.

Fig. 93 shows that we import more goods (chiefly cotton, tobacco, petroleum, and wheat) from the United States than from any other country. Of our ten best customers, six are members of the British Commonwealth of Nations. These states, together with the

Argentine, supply us with primary products (principally wheat, meat, wool, and dairy produce), and in return purchase manufactured goods.

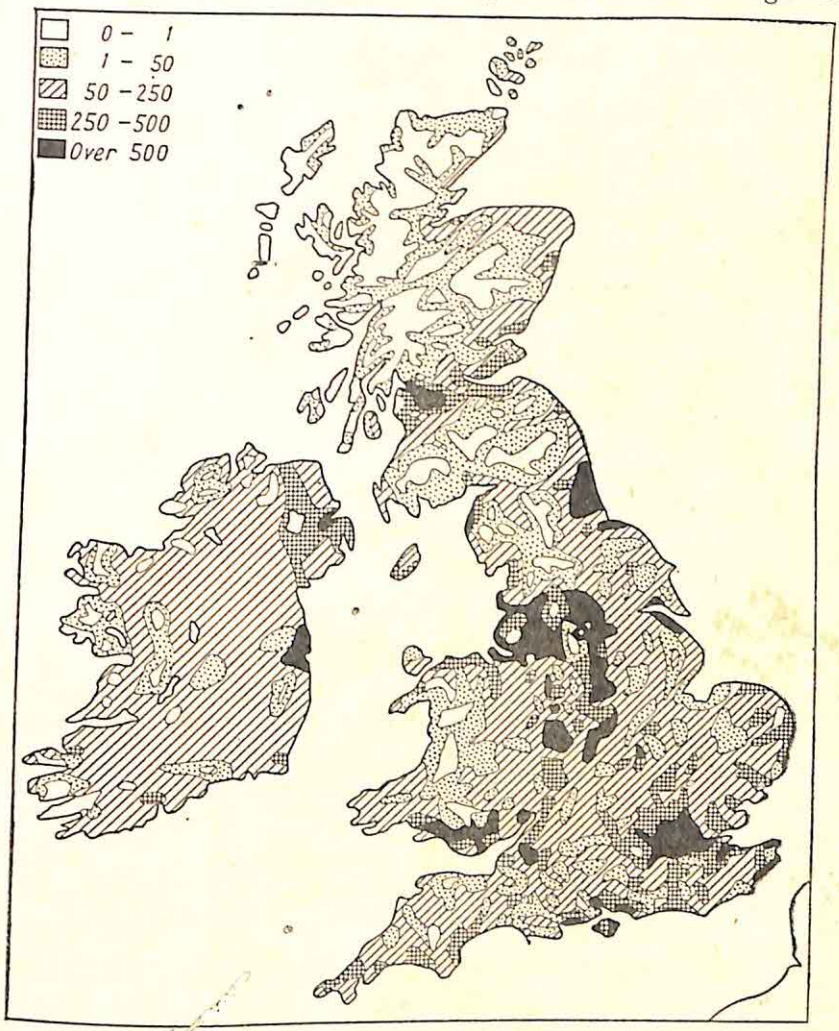


FIG. 92. British Isles: Distribution of population per square mile.

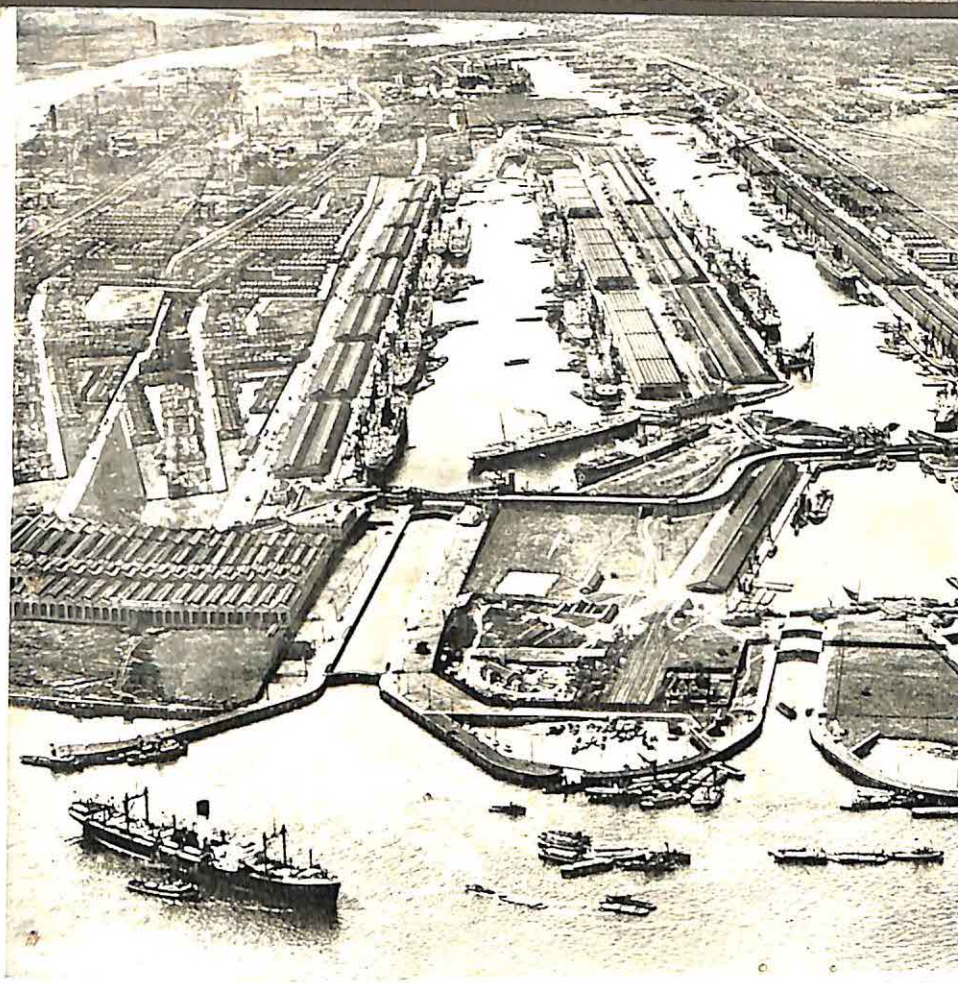
Population. Compare the population map (Fig. 92) with those showing relief and the distribution of coal. It will be noticed that the most thickly peopled areas are (*a*) the manufacturing districts

on the coal-fields, and (*b*) the region round London. There has, in recent years, been a steady movement of population to the latter area, due largely to the development of manufacturing consequent upon the increased use of electricity. The most thinly peopled areas are the Highlands of Scotland, the Uplands of Wales, and the Pennines. Except for the districts round Dublin and Belfast, Ireland is sparsely peopled, as it is mainly an agricultural country.

FIG 93. Imports from Union of South Africa do not include gold.*

FIG. 94.

* Note. The diagrams on this page, and similar diagrams in this book, are based on recent normal three years' averages.



Aerofilms

9. LONDON'S DOCKS

The *King George V Dock* (*left*) and the *Royal Albert* and *Victoria Docks* (*right*), which togeth
form the world's largest sheet of enclosed dock water. The locks at the entrance to t
docks serve to keep the water-level constant. In the foreground is seen a cargo liner p
paring to enter *King George V Dock*. The warehouses alongside the quays are filled w
meat, grain, tobacco, and other commodities. The picture faces up stream. At the top l
is seen the great curve enclosing the 'Isle' of Dogs (*left bank*) with Milwall Dock (*left*) a
the India Docks (*right*). With the exception of the *Surrey Docks*, all the docks along t
Thames lie on the left bank. Each has its own special trade. Thames barges are wid
used for conveying goods from the ship to the warehouses along other parts of t
river, and for transporting produce from an incoming to an outward-bound vessel.

10. SLATE, KAOLIN AND COAL

(*Above*) A slate quarry in North Wales with the Snowdon Range in the distance (see p. 155). (*Below left*) Stocking saggars, the containers in which the is placed, in an oven ready for firing, in a famous Stoke-on-Trent pottery. Much of aolin, or china clay, is obtained from Cornwall and Devon. (*Below right*) Miners in a Tyneside mine being carried in coal tubs to the seams (see p. 166).

EXERCISES

1. Illustrating your answer by a sketch-map, describe the physical features of the English Plain.

2. In what parts of England are many of the older buildings constructed of local stone? Name the type of stone used in the localities you mention.

3. Compare and contrast the physical features of Scotland and Ireland.

4. The annual rainfall at Valencia is 55·7 inches, and at Nottingham 22·6 inches. Account for the difference in rainfall between these two places.

5. (*a*) What type of climate has the British Isles? Name *one* country in the Southern Hemisphere with a similar type of climate. (*b*) Which parts of the British Isles are (i) warmest in summer; (ii) coldest in winter; (iii) coolest in summer; (iv) mildest in winter; (v) most equable throughout the year; (vi) have the greatest range of temperature; (vii) have the least range of temperature? In each case state briefly the reasons for your answer.

6. What kind of weather would you expect in July when an anti-cyclone was centred over the British Isles?

7. How do you account for the following facts: (*a*) the leading milk-producing counties in England are Cheshire, Lancashire, Staffordshire, and Derbyshire; (*b*) Essex, Norfolk, Lincolnshire (Lindsey), and the East Riding of Yorkshire are the chief wheat-growing counties in the British Isles; (*c*) the district round London and also the Scilly Isles grow much vegetable produce; (*d*) Pigs are widely reared both on the Irish Plain and in Lincolnshire?

8. Give an account of the North Sea fisheries with special reference to British ports.

Note. Since the Second World War, owing to a variety of causes, there has been a serious decline in British coal production; and at the present time coal is not an important export.

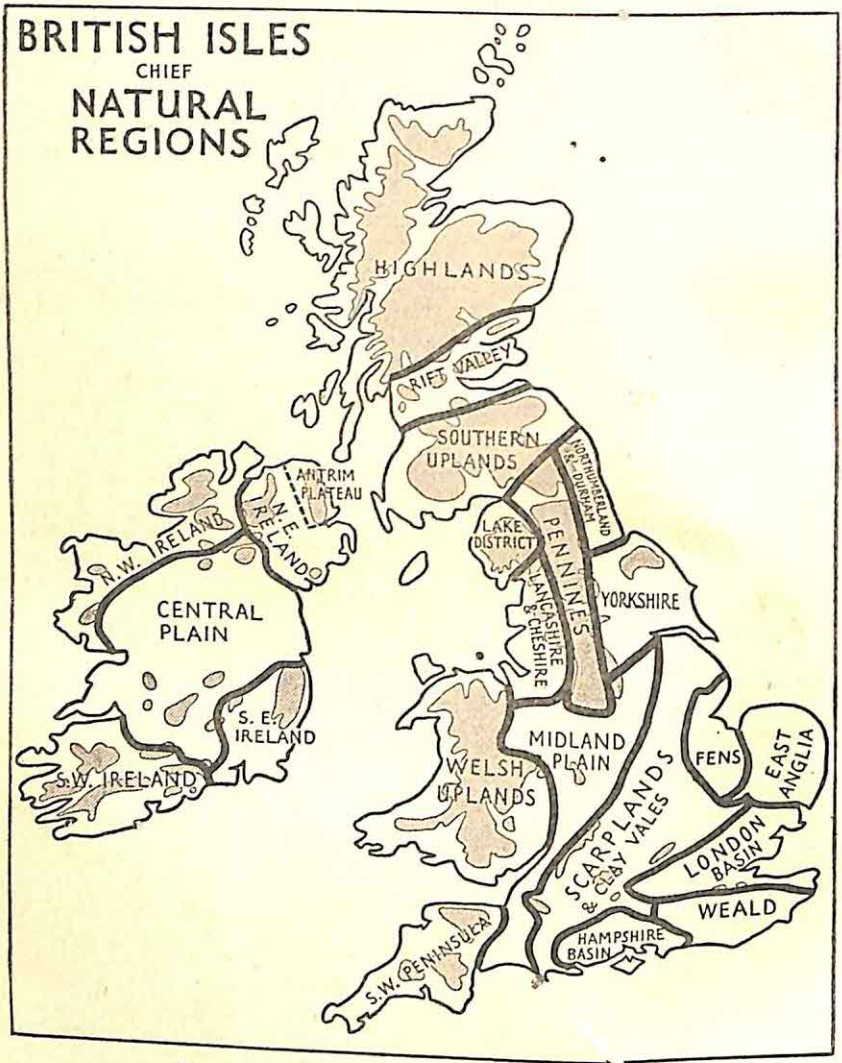


FIG. 95. British Isles: Chief Natural Regions.

CHAPTER XII

REGIONS OF THE BRITISH ISLES

GREAT BRITAIN

South-West England. South-West England with its genial climate, indented coasts, heather-clad moors, and verdant valleys, has a charm peculiarly its own. Devon and Cornwall differ somewhat in structure and relief from Somerset, but Somerset shows such marked resemblances to its neighbours that to these three counties the term 'The West Country' is applied.

The peninsula of Cornwall and Devon consists mainly of sandstones and slates through which have been thrust up granite bosses, from which veins containing tin, copper, and other ores extend into the surrounding sedimentary rocks. The chief of these granite masses are Dartmoor and Bodmin Moor, separated by the valley of the Tamar. In North Devon, Exmoor, whose cliffs rise a thousand feet above the Bristol Channel, is composed chiefly of sandstones and slates. On the east this upland is continued by the Quantocks into Somerset. Bleak, rain-drenched plateaus, like Dartmoor, with their thin infertile soils, are quite unsuited for cultivation. There are few trees, and large stretches are covered with coarse grass, interspersed with bogs. Small ponies and deer roam over the moors, while from spring to autumn cattle and sheep graze on the rough pastures, returning to the valleys for winter.

The sparsely peopled uplands present a great contrast to sheltered lowlands like the Plain of Devon, drained south by the Exe and north-west by the Taw and the Torridge to Barnstaple Bay. The New Red Sandstone of the Plain weathers to form fertile loam soils which furnish orchard lands and pastures for the famous Red Devon cattle, bred primarily for beef. The mild climate of the southward-facing valleys favours the production of early vegetables, fruits, and flowers for London and other markets.

For centuries the peninsula was noted for its tin and copper mines found on the margins of the granite uplands. But mining is no longer important, and adventurous Cornish miners have migrated to all parts of the world. The decline in mining is due partly to the exhaustion of the more accessible veins, but chiefly to the competition

of more cheaply worked ores from overseas. Cornwall and Devon still produce much *kaolin*. Formed by the decomposition of granite, it occurs in 'pockets', or hollows, on the borders of the granite bosses. Much is dug round St. Austell, Bovey, and Lee Moor (near Plymouth), whence it is exported through ports such as Fowey,

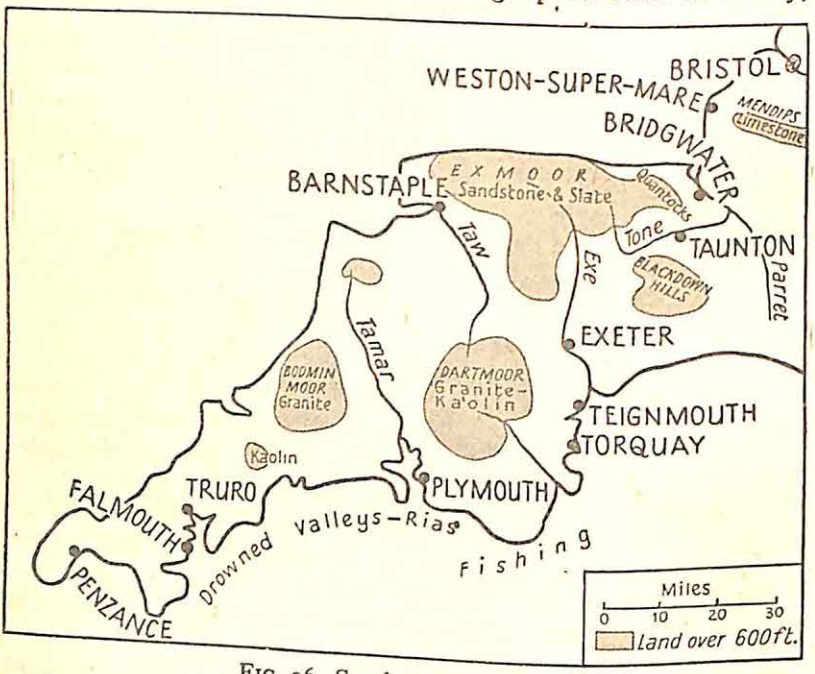


FIG. 96. South-west England.

Newton Abbot, and Plymouth to the Staffordshire Pottery District, to Worcester, and even to the United States. In Somerset there are two small coal-fields, one on the outskirts of Bristol and another north of the Mendips.

The coasts of Cornwall and Devon, with their bays, rugged headlands, and estuaries, are famed for their beauty, which attracts thousands of visitors each year. From Falmouth to Exeter the 'drowned' ends of the valleys form rias, some of which, like Falmouth and Plymouth Sounds, are magnificent harbours. Most of the ports are small. St. Ives, Falmouth, Brixham, and Penzance are fishing centres. Penzance is the port for the *Scilly Islands*, which are noted for their

early vegetable produce. Torquay and Ilfracombe are sea-side resorts. The city of *Plymouth*, comprising Plymouth, Devonport, and Stonehouse, the only really large centre, is a naval port with repair and shipbuilding yards, and a port of call for trans-Atlantic liners. From Plymouth the Southern Railway runs north and the Great Western Railway south of Dartmoor, to Exeter, a cathedral city

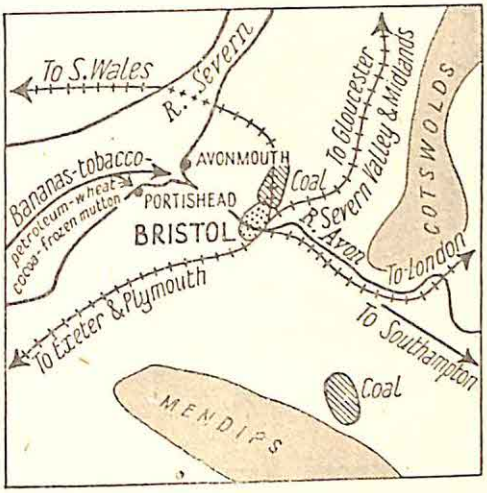


FIG. 97. The site of Bristol.

whence the route runs up the Exe valley, and thence to Taunton, on the Tone, the county town of Somerset.

The *Plain of Somerset*, drained by the Parret to the flat coast here margining the Bristol Channel, stretches from the Quantock and Blackdown Hills to the Mendips. Like those of Devon, the valleys opening to the plain are noted for their cider-apple orchards, while the low-lying meadow lands are devoted to dairying. Much milk is sent to Bristol, but some is made into cheese which takes its name from Cheddar, a picturesque village at the foot of the famous Cheddar Gorge, through the Mendip Hills. Weston-super-Mare is a popular sea-side resort; Bath, on the Avon, has for centuries been a noted spa. Vessels of moderate size can ascend the Avon to *Bristol* (410,000), but larger steamers anchor at Avonmouth or Portishead. The colonial trade of Bristol dates from the days of the slave trade, when the city was a port of call for vessels carrying their human

freight from Africa to the West Indies. Her imports from the latter include bananas, as well as cane sugar, which with tobacco, cacao, and wood pulp, supplies raw material for various manufactures. Fig. 97 shows the chief routes serving the city.

The Hampshire Basin. Enclosed by the semicircle of chalk uplands formed by the Purbeck, Western, and Hampshire Downs is

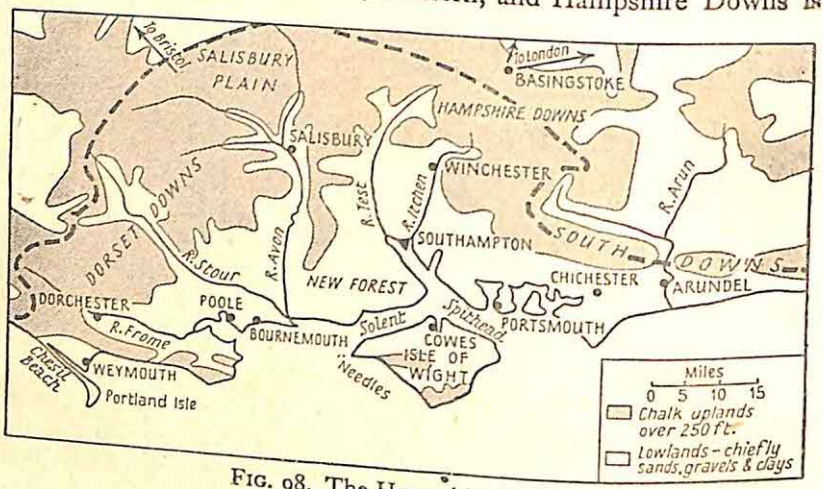


FIG. 98. The Hampshire Basin.

a *downfold* where the chalk has been covered with gravels, sands, and clays. This region is the Hampshire Basin, in which we may include the *Isle of Wight*. Farming is the chief occupation. Sheep are grazed on the Downs, cattle on the lowlands and in the valleys, while crops include cereals and fruit. The New Forest covers much of the sandy district to the west of Southampton Water. Portsmouth, like Weymouth (Dorset), is a naval base. Its four tides a day, which enable vessels to dock at any time, have helped to make *Southampton* the premier passenger port in the British Isles, and an outport for London. Of a number of routes converging on the town, one runs up the Itchen valley to Winchester, once the capital of England, the other through Salisbury to Bristol. Bournemouth and other sea-side towns, including a number in the Isle of Wight, are popular resorts.

South-East England. From the Hampshire Downs the *North* and *South Downs* run east, enclosing within their inward-facing

escarpments the Weald. At the foot of the scarps scattered farm-houses and villages tell of springs occurring where water, after filtering through the porous chalk, comes to the surface at its junction with the impervious clay. The Downs are the remains of a

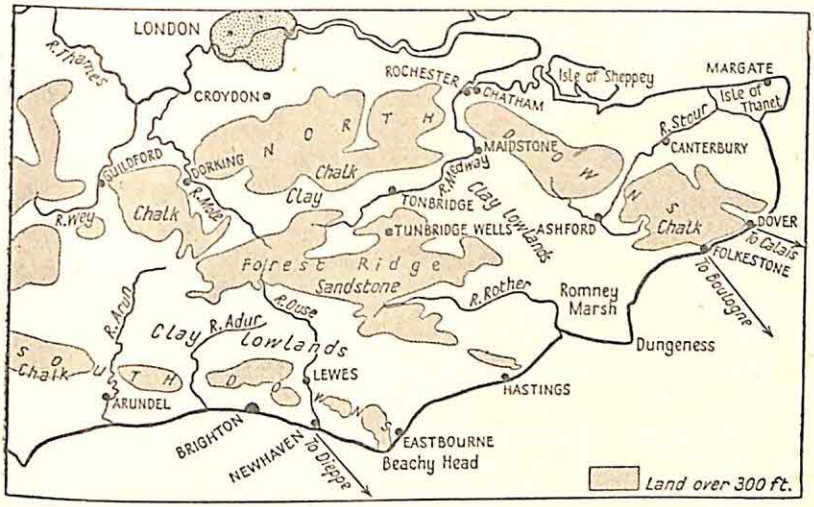


FIG. 99. South-east England.

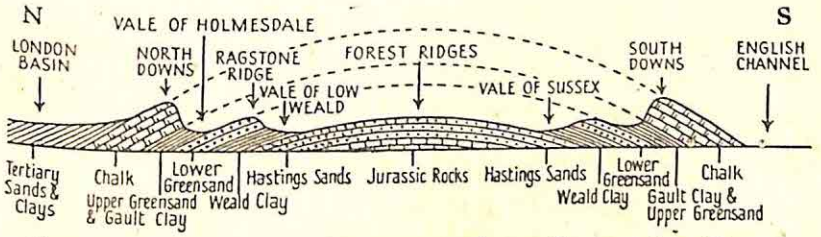


FIG. 100. Generalized section across south-east England from N. to S.

dome-like *upfold* of which the central portion has been worn away, exposing the underlying clays and sandstones of the present Weald. This depression extends to the English Channel, beyond which it may be traced through the Boulonnais region of Northern France. In the centre of the shallow basin forming the Weald, hard resistant sandstones compose the Forest Ridge (see Fig. 100), which runs parallel to the Downs. Its woodlands remind us that at one time the

whole of the Weald was thickly forested, its trees yielding timber for ships and charcoal for smelting local iron ore. The iron industry left Kent at the time of the Industrial Revolution, but it may be revived with the development of the Kent coal-field.

Before the original chalk dome was worn away, streams ran north and south, cutting their valleys into the chalk. The gaps in the North and South Downs, which are the remains of these former *consequent* valleys, now provide sites for towns and are utilized by roads and railways. Among the 'gap-towns' in the North Downs are Guildford, on the Wey, the county town of Surrey; Maidstone, the county town of Kent, at the southern end of the Medway gap, and Rochester–Chatham at its northern end; and historic Canterbury, at the northern end of the Stour gap. Similarly placed in gaps in the South Downs are Arundel, on the Arun; and Lewes, the county town of Sussex, on the Ouse.

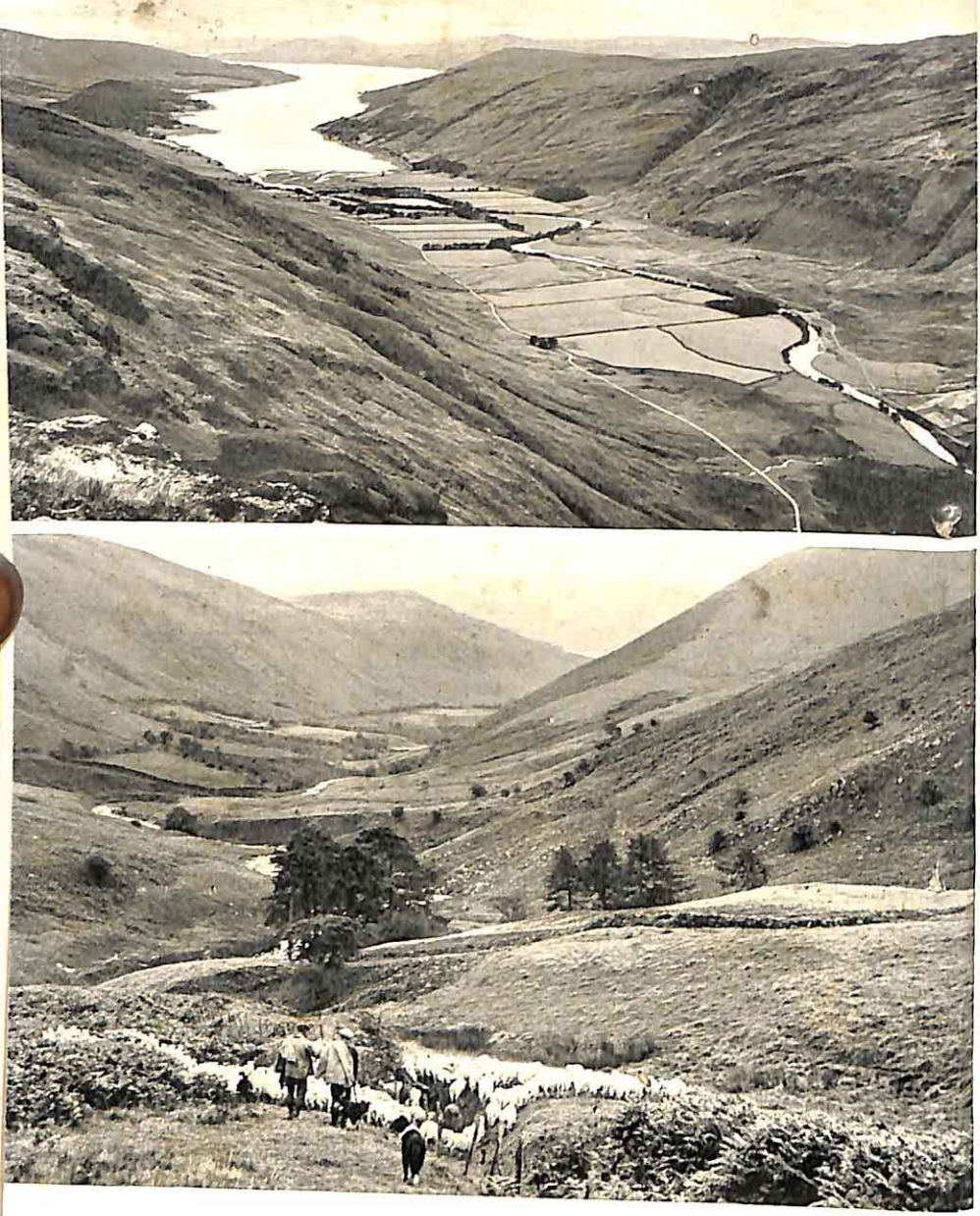
Many coastal towns like Bognor Regis, Worthing, Brighton, Eastbourne, Hastings, Margate, and Ramsgate, are pleasure resorts. The packet stations of Dover, Folkestone, and Newhaven remind us of the close connexion of South-East England with the Continent.

The agricultural products are varied. On the chalk Downs sheep are grazed and some wheat is grown, while dairy cattle, pastured in the clay vales, provide milk for London and other populous centres. The relative dryness, absence of cloud, and high percentage of sunshine, coupled with the mixed soils, favour the growing of fruit and hops, for which East Kent is specially noted. The proximity of London accounts in large measure for the chain of market gardens stretching from the lower Medway westward along the Thames estuary. The life of South-East England is intimately bound up with that of the metropolis, for not only does much of its produce find a market there, but many people who earn their livelihood in the capital have their homes in the wooded country of the Weald, or at places along the coast.

The Central Scarplands. From Dorset to Yorkshire the limestone and chalk ridges, with the intervening clay vales, which form the *Scarplands*, are a striking feature of the English Plain. This central region is intimately bound up with adjacent areas. Indeed the Vale of Pickering, between the limestone North York Moors and the chalk Yorkshire Wolds, is more conveniently studied with the

11. CONTRASTING INDUSTRIES

(*Above*) The uncompleted hulls in the foreground will be floated down the slipways in the Clyde, along whose banks lie the most important shipyards in the world. The gantries are a typical feature of such shipyards. (Photograph, Aerofilms Ltd.) (*Below*) On this Bleach Lawn, in Northern Ireland, men are spreading out long strips of linen to be bleached in the open air. Note the man driving the machine in the middle of the ground.



12. RURAL SCENES IN SCOTLAND AND WALES

(*Above*) Alluvial land at the head of Loch Fyne, Argyllshire, which is being successfully cultivated by crofters. The surrounding heather-clad hills provide pasture for sheep, as do the Welsh Uplands (*below*) where shepherds, aided by their sagacious dogs, are driving a flock of sheep down the valley to the farm. On the moorlands dry stone walls enclose large tracks of pasture over which the sheep wander (see p. 155).

rest of Yorkshire; and Dorset with South-West England and the Hampshire Basin.

The ridges drop by steep escarpments on the north-west, but

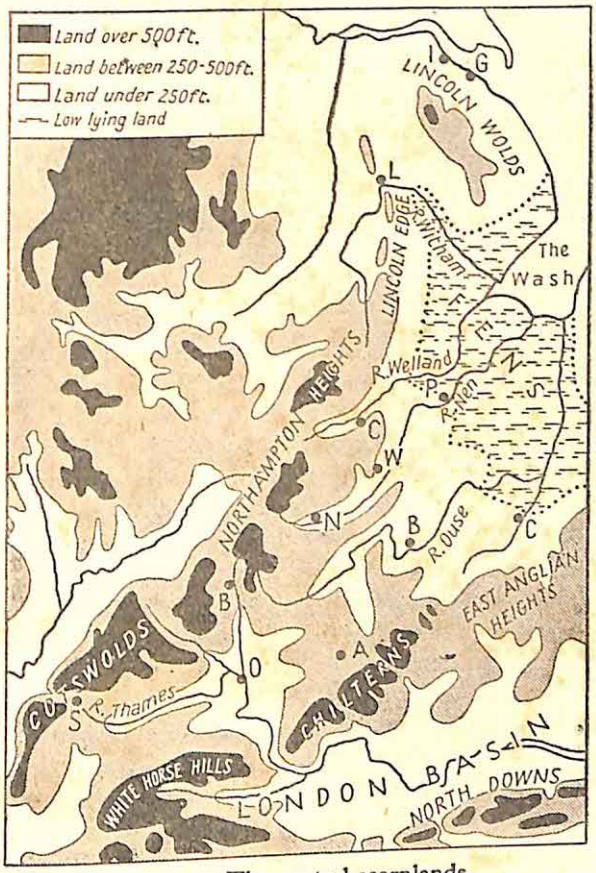


FIG. 101. The central scarplands.

descend by long gradual dip-slopes to the clay lowlands. Among the numerous streams running down these gentler dip-slopes are the Thames and its tributaries the Windrush, Evenlode, and Cherwell; and the Ouse, Nen, and Welland, which flow sluggishly across the lowlands to the Wash.

Farming is the principal industry. Wheat, barley, and roots are

grown both in the plains and on the uplands, where the fields are often strewn with stones. Much dairying is carried on in the clay vales; such towns as Aylesbury, at the northern end of the Chiltern Gap and a focus of other routes across the lowlands, and Banbury, are leading centres for the collection and distribution of milk. The latter town has also one of the largest cattle markets in the British Isles. Hides still provide part of the raw material for the boot factories at *Northampton* and Kettering, though much leather is now imported from the grasslands of Canada, the Argentine, and Australia. Sheep yield wool which is made into blankets at Witney; and cloth at Bradford-on-Avon, Westbury (Wilts), and Stroud, in a transverse valley leading through the Cotswolds.

The Evenlode and Cherwell valleys converge on that of the Thames at *Oxford*, which, like many university towns, is a printing and publishing centre, while modern industry is further represented by the huge motor-works on the outskirts of the city. Its sister university town of *Cambridge* stands on the margin of the Fens. *Bedford*, on the Ouse, is noted for its schools. The cathedral city of *Lincoln*, in the gap cut by the Witham through Lincoln Edge, manufactures agricultural and excavating machinery.

The Jurassic Limestones yield iron ore smelted at Scunthorpe, Wellingborough, and Corby, near Kettering. In the limestone districts the churches and older house are built of local stone; in the chalk lands partly of flint; but in the clay vales both older and newer dwellings are constructed of brick.

The London Basin. The London Basin is a shallow trough formed by a *downfold* in the chalk upon which has been deposited sands, gravels, and clays. It is a triangular depression extending from the Vale of Kennet, along both sides of the Thames, and widening towards the North Sea. The Basin is flanked by the chalk *upfolds* of the Chilterns and East Anglian Heights on the north-west, and by the North Downs on the south.

Shortly after entering the Basin through the Goring Gap, between the White Horse Hills and the Chilterns, the Thames receives the Kennet, the united stream following the direction of the latter river. *Reading*, at the confluence of the two, is the second largest town in the Basin. Biscuits were originally made here because much wheat was grown in the surrounding district. This is no longer the case,

but the persistence of the industry, to which must be added the manufacture of other foodstuffs, provides an interesting example of *geographic inertia*—the tendency on the part of established industries to remain where they are long after conditions have changed.

The beech woods of the Chilterns still provide part of the timber for the chair factories at *High Wycombe*, though much material is now imported from Sweden. Dairying, market gardening, fruit

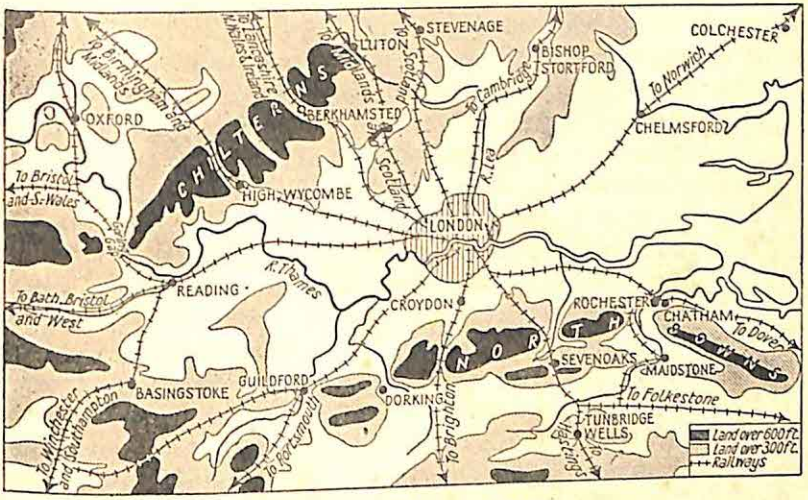


FIG. 102. The London Basin.

growing, and poultry farming are among the leading rural occupations both in the Thames valley and Essex, where to some extent they have replaced wheat growing. Essex is still, however, the leading county in Britain for the production of wheat.

Essex and the Thames valley are residential districts for people working in London. In recent years the region around the capital has been transformed by the establishment of many industries, stimulated by cheap electric power. Among them are paper-making (pure water) at Watford and St. Albans, engineering at Chelmsford, Braintree, Colchester, and Luton (also famed for hats); the making of motor vehicles at Dagenham, and linoleum at Slough.

London. The life of the London Basin, and indeed of the whole of South-Eastern England, is intimately bound up with that of the metropolis. The city arose at the lowest spot where the Thames

could be bridged. At this point it grew up on the left bank of the river on firm ground which rose above the marshes to west and east. Here routes coming from the Continent via Dover, and confined between the North Downs and the right bank of the Thames, were able to cross the river, after which they spread out fan-like in all directions. Nearly all the ways radiating from London pass through gaps in the surrounding chalk hills, whose position (see Figs. 102, 103) should be carefully noted. At London land-ways meet sea-ways converging on the Thames estuary from all parts of the earth. Some of the vessels unload their cargoes at wharves alongside the river, and some into lighters which carry them to their destination. Other ships discharge, or load, freight in docks where they are independent of the state of the tide. With the exception of the Surrey Commercial Docks, all these docks lie along the left bank of the Thames.

London has an excellent underground railway system, for the underlying clay made the construction of lines a comparatively easy matter for skilled engineers. Croydon, the chief airport, lies to the south.

The industries of London, like those of Paris or Berlin, are too numerous to enumerate, but among them may be mentioned the manufacture of soap, furniture, glass, matches, and chemical products, and it should be noted that different districts specialize in different commodities. London is also a great wool, tea, rubber, and coffee market. It is the seat of the Government, the world's leading banking centre, and is noted for its university and other educational institutions. After New York it is the largest city in the world. Its population of seven millions is almost double that of Birmingham, Glasgow, Manchester, and Liverpool combined. It is the capital of England and the Mother City of the British Empire. To it people come by steamer, rail, and air from every quarter of the globe; from it they go to the ends of the earth.

East Anglia. The name of East Anglia is derived from the Angles who, sailing up the estuaries of the Orwell and the Yare, occupied the districts that are now Norfolk and Suffolk. Here and there the level surface of these counties is broken by low hills, but even the East Anglian Heights do not exceed 300 feet. Much of this region is covered with boulder clay and glacial sands and gravels. These form a fertile soil, which, coupled with the climate, makes East Anglia one of the best arable farming areas in the country. There is

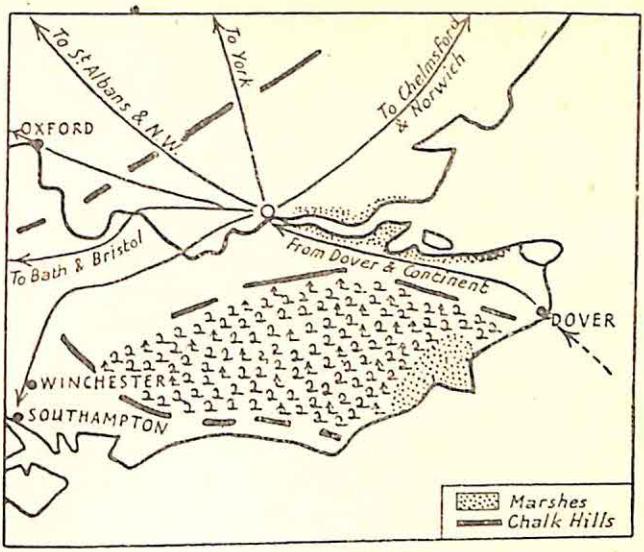


FIG. 103. The site of London. A 'bridge' town and route centre.

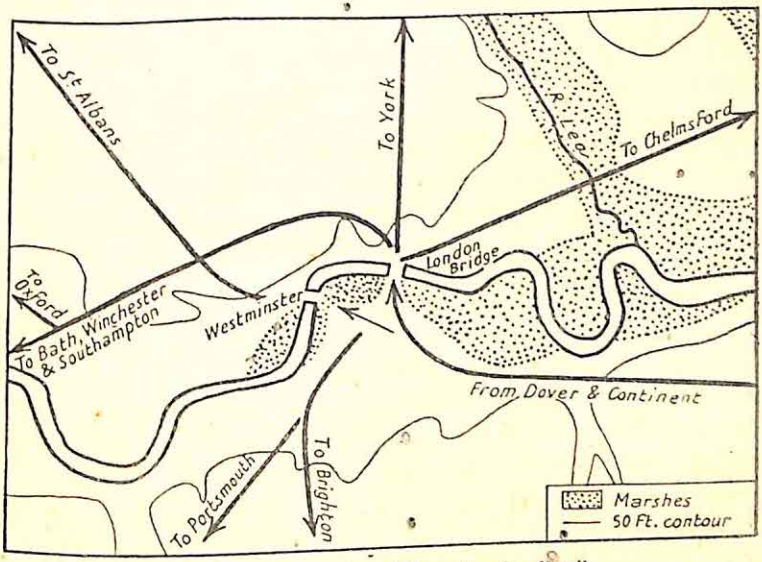


FIG. 104. The site of London in detail.

considerably more plough- than pasture-land. Wheat and barley are the chief cereals, and quantities of potatoes, sugar-beet, and other root crops are grown.

The coasts are low. In the north they are being steadily eroded. Some of the material thus worn away has been carried south by the currents and has blocked up the original mouths of such rivers as the Yare and Alde, forcing them to find fresh outlets farther south. Such silting, by closing river mouths and turning them into shallow

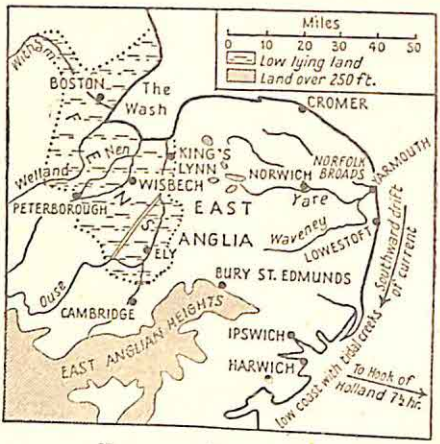


FIG. 105. East Anglia.

lakes, was largely responsible for the formation of the Broads—that wonderful holiday-ground for people fond of boating and fishing.

The packet station of Harwich stands on the only good harbour between the Thames and the Humber. *Ipswich*, at the head of the Orwell estuary, mills flour and malts barley. Farther north Yarmouth and Lowestoft are noted fishing ports. *Norwich*, the largest town in East Anglia, stood in historic times at the head of tidal navigation on the Wensum, not far from its confluence with the Yare. Like many towns in farming areas it makes agricultural machinery; its other industries include the manufacture of mustard, grown locally, boots and shoes, and flour-milling.

The Fens. For many centuries the low-lying Fenlands round the Wash were undrained marshes forming a barrier between the Scarplands on the west and East Anglia on the east. To-day across these

former swamps the Witham, the Welland, the Nen, and the Ouse flow slowly towards the Wash. The whole region is crossed by a network of drainage canals which carry surplus water to the rivers, into which it is lifted by pumping stations. Wheat, potatoes, turnips, and sugar-beet thrive on the rich black earth of the Fens. Fruit is grown to the north of Cambridge, on the Fen margin, and round Wisbech, a river port on the Nen which, like Spalding, is also a centre for vegetables and bulbs.

The land is so flat that even an elevation of a few feet breaks the monotony of the plain. On gentle rises, above flood level, stand villages and towns. Ely and Peterborough were both founded on gravel islands in the Fenlands. Ely, though a cathedral city, is little more than a large village. Peterborough is a town of moderate size with breweries and brickyards. Its future is bright, for when the project, now being undertaken, for canalizing the Nen is completed, it will become an inland port accessible to sea-going 300-ton motor barges. This scheme will also be of great benefit in draining the Fenlands, which, in spite of the many canals that have been constructed, are still subject to disastrous floods.

The Midlands. The undulating plateau comprising the Midlands forms the heart of the English Plain. On the north this region is bounded by the Pennines, on the west by the Welsh Uplands, and on the south-east by the oolitic limestone escarpment. The rocks of the Midland region consist chiefly of New Red Sandstones, marls, and pebble beds which weather to form fertile soils. Above these young rocks rise 'islands' of harder, older rocks whose main importance lies in the fact that they bear the Midland coal-fields. The chief of these upland areas (Fig. 106, p. 153) are: (1) *Charnwood Forest* and the *Leicestershire coal-field* centring round Ashby-de-la-Zouche; (2) the *Warwickshire coal-field* extending from *Tamworth* to *Nuneaton*; (3) the *South Staffordshire coal-field* and the *Clent* and *Lickey Hills*; (4) *Cannock Chase* and the *North Staffordshire coal-field*; and (5) the *Wrekin* and the *Shropshire coal-field*. To these areas must be added (6) the southern portion of the *York–Derby–Nottingham coal-field*.

Outside the industrial areas, stretches of heather, with scattered larch and pine, still cover the sandy uplands, while trees dot the pastures. At one time considerable quantities of wheat were grown in the Midlands, but now much of the wheat-land has been replaced

by grass, and in all the Midland counties more than half the surface is under pasture. On the damper meadow-lands many dairy cattle are grazed; on drier grass-lands, such as those of Leicestershire, sheep are reared. In such a pastoral region hides are plentiful: tanning is carried on in a number of towns where the water-supply is suitable; boots are manufactured at Stafford and Leicester, and leather goods at Walsall.

The *Vale of Evesham*, drained by the Warwickshire Avon, is noted for its market gardens and orchards. Strung along the river itself are the historic towns of Tewkesbury, Evesham, Stratford, Warwick, and Rugby, the last-named being an important railway centre.

The *Black Country*, a stretch of high land in the centre of the Midlands forming the watershed between the basins of the Severn and the Trent, depends for its mineral wealth on the South Staffordshire coal-field. *Birmingham* (1,000,000), on the edge of the Black Country, is the second largest town in England. Since the sixteenth century it has been famed for its iron goods, and at the present time it manufactures metal goods and electrical equipment of all descriptions. Many of the Black Country towns specialize in some particular branch of the metal industry: Dudley makes screws, anvils, and vices; and *Wolverhampton* manufactures bicycles and motor-cars as well as wrought iron and tin-plate. Stourbridge uses local fire-clay for making fire-bricks required for lining furnaces, and with nearby Brierley Hill is famed for its glass.

On the *North Staffordshire coal-field* the Pottery towns (Stoke, Hanley, Burslem, Longton, and Tunstall), forming the city of *Stoke-on-Trent*, are, as their name implies, engaged in making pottery. The chief raw materials are kaolin (china clay), bones (used in the manufacture of porcelain), and flints. The china clay comes chiefly from Devonshire; the flints mainly from the Flemish coast and from Newhaven; and both materials are brought by boat to Runcorn, whence canal barges carry them to the Potteries. The local clay, though providing material for many brick- and tile-yards, is only used in the pottery industry itself for making saggars, the containers in which the ware is placed before being put in the firing ovens.

On the northern edge of the Midlands Leicester, Derby, and Nottingham are important manufacturing centres. *Leicester* is noted for woollen goods and footwear; *Derby* has railway works and makes aeroplane engines and motor-cars; *Nottingham*, an inland

port on the Trent, manufactures hosiery, lace, and tobacco, and is also an engineering centre. Burton, higher up the Trent, is noted for its brewing industry. *Coventry*, a little to the south of the Warwick-

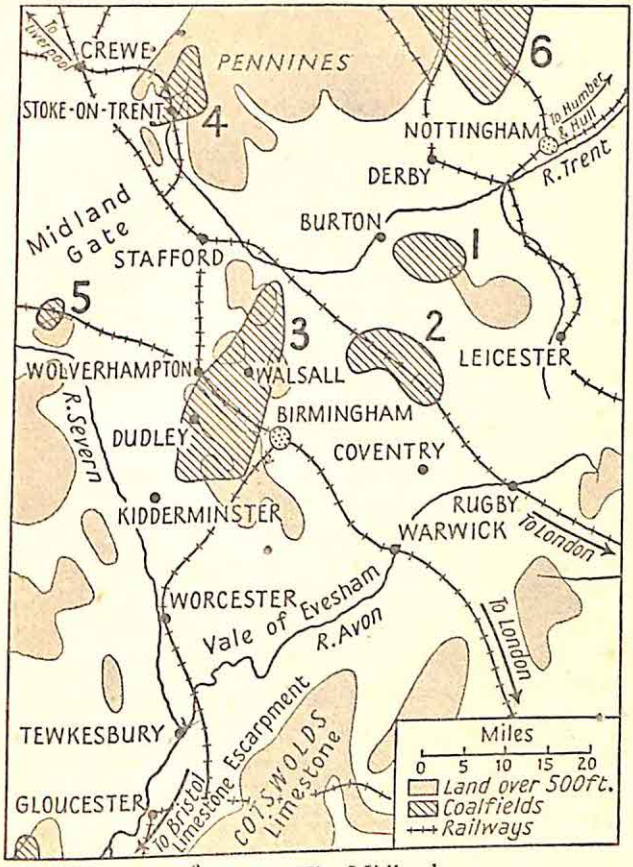


FIG. 106. The Midlands.

shire coal-field, is a leading centre for motor and general engineering and the manufacture of artificial silk.

The four ports serving the Midland area are Liverpool, Hull, Bristol, and Southampton. Liverpool is the chief port for the import and export trade of the Potteries and the Wolverhampton district; the trade of Birmingham and the surrounding district is more equally divided among these four ports.

Wales and its Borders. The Welsh Uplands are margined by a narrow coastal plain on the north, and by the wider lowlands on the south. The Uplands are composed mainly of old rocks, such as sandstones and slates, with a fringe of somewhat younger rocks, like

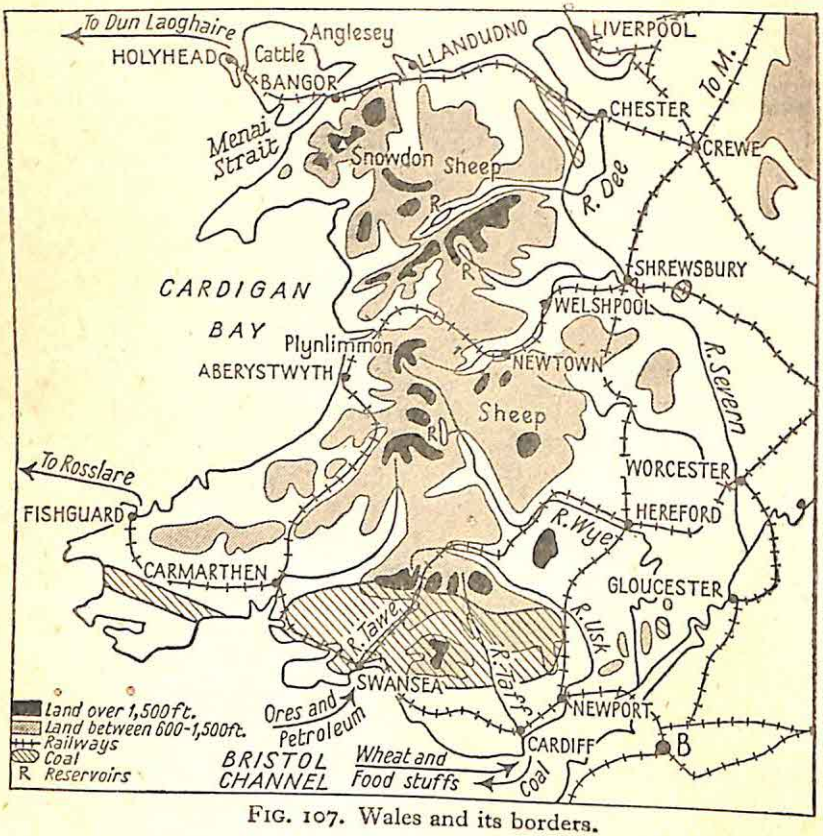


FIG. 107. Wales and its borders.

Old Red Sandstone, Carboniferous Limestone, and Coal Measures. Ice has played a great part in moulding the surface of the uplands whose rounded plateaux are separated by valleys deepened by the passage of former glaciers. Here and there more resistant igneous rocks rise as peaks above the surrounding uplands. In the north-west Snowdonia (3,560 feet) is separated by the Menai Strait from the island of Anglesey. There are some hydro-electric power plants near Snowdon. South of the Dee valley rise the Berwyn

Mountains, from whose southern slopes rivers such as the Vyrnwy find their way to the Severn. The Vyrnwy has been dammed to form a lake which is a reservoir for Liverpool, and Birmingham draws its water supply from the Elan Valley, near Rhayader, in Central Wales.

In South Wales the Black Mountains are separated from the Brecon Beacons by the sandstone Vale of Usk which, like the neighbouring valleys of the Taff and the Tawe, forms a route from the Plain of Glamorgan to the South Wales coal basin.

Sheep, bred on the upland pastures, yield mutton and wool. Much wool is sent to Yorkshire, and a little is still manufactured at Newtown, Welshpool, and other towns in the upper Severn valley.

The Severn and the Wye both rise on the slopes of Plynlimmon. The Wye follows a more direct course to the sea. After flowing across the Plain of Hereford, with orchards, pastures, and hop-gardens, it cuts its way through its famous limestone gorge before entering the Bristol Channel.

Shrewsbury stands on high ground almost enclosed by a meander of the Severn. Its site easy of defence, and its command of routes, early made it important, and later led to its development as a railway junction. It is the town most easily reached from all parts of Wales. Through it run railways from South Wales to the north. From the east come lines from the Midlands; to the west a railway runs to Aberystwyth, a sea-side resort and university town on Cardigan Bay.

South of Shrewsbury the Severn flows through a gorge between the South Shropshire Hills and the Wrekin. Then the valley widens, and the river runs through a region of pasture-lands, orchards, and hop-gardens, past Worcester, near the confluence of the Teme and Severn; Tewkesbury, situated where the Warwickshire Avon enters the Severn; and *Gloucester*, at the head of the estuary, standing at the lowest spot where the river is bridged.

The railway from Shrewsbury to Chester runs through Ruabon and Wrexham, mining towns on the small *North Wales coal-field*. From Chester the line to Holyhead (the packet station for Kingstown (Dun Laoghaire)) runs along the narrow plain between the mountains and the sea, where stand watering-places like Llandudno, and historic towns such as Conway and Carnarvon, whose castles remind us of the conquest of Wales by Edward I. Slate, quarried in the neighbourhood of Snowdonia, at Penrhyn and Bethesda, and

granite are exported from small ports along the coast; but the main industry of North Wales is catering for holiday-makers, especially those from Lancashire.

South Wales stands apart from the rest of the country. Here life is bound up with the great coal-field, the third largest in Britain.

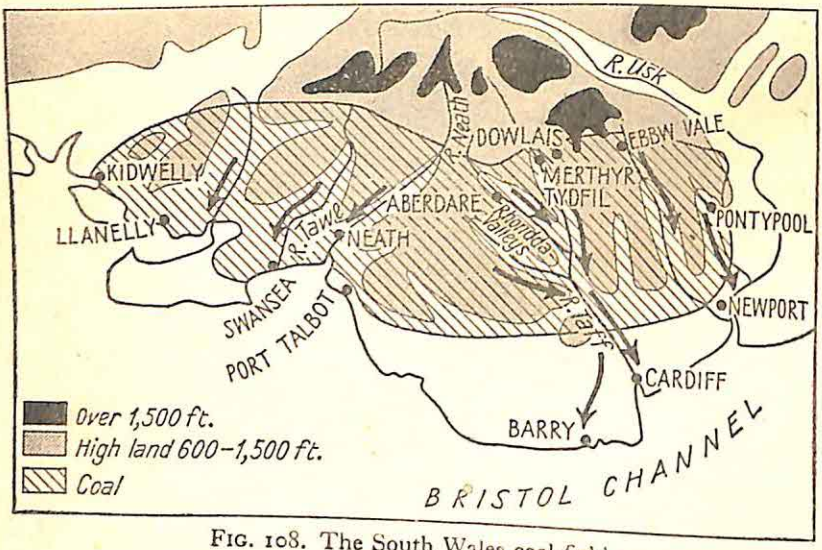


FIG. 108. The South Wales coal-field.

The South Wales coal basin extends from Pontypool in Monmouthshire westward for 60 miles to Kidwelly, in Caermarthenshire. The numerous streams have cut through the sandstone to the underlying Coal Measures, and so galleries can be run horizontally into the mines instead of shafts having to be sunk to great depths at much expense. The coal is of high grade and includes steam coal for which the Rhondda valleys are noted. Among the inland towns *Merthyr Tydfil* and Dowlais are still engaged in iron-smelting, but as most of the ores are now obtained from abroad, especially from Northern Spain, the newer blast-furnaces are situated at ports like Cardiff and Port Talbot. *Cardiff*, with Barry Dock, exports more coal than any other port in the British Isles. *Swansea* is the outlet for the western portion of the coal-field. Formerly tin and copper were sent from Cornwall to be smelted at Swansea, but to-day partially smelted tin ores from the Malay States, Bolivia, and Nigeria, copper ores

from Spain and Chile, and nickel ores from Ontario are imported and refined here. Swansea also manufactures tin plate and galvanized-iron sheets and refines oil, while its neighbours Port Talbot and Llanelly make copper sheets and copper wire.

The South Wales coal-field, with about 800 persons to the square mile, is the only densely peopled area in Wales. Trade depression has made it difficult to find employment for many workers, with the result that there is poverty in many districts. The *Plain of Glamorgan*, to the south, is devoted mainly to dairying, the bulk of the milk being sent to the industrial area.

The *Great Western Railway*, which serves this part of Wales, runs along the coast to Fishguard (the packet station for Rosslare), while a branch line runs to Pembroke on Milford Haven, one of the finest harbours in Great Britain.

FIG. 109. Simplified geological map of the Pennines.

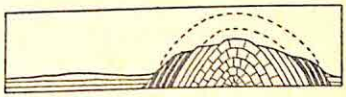


FIG. 110. Diagrammatic section across the Pennines.

The Pennines. The Pennines stretch from the Tyne Gap southward for 150 miles to the Vale of Trent, decreasing in average altitude from 2,000 feet in the north to 1,000 in the south. The rocks of which they are built are mainly Carboniferous Limestones, Millstone Grits, and Coal Measures (composed of layers of sandstones, shales, coal, and fire-clays) (Fig. 109). Millions of years ago these rocks were formed on the bed of some shallow sea. Later they were bent into upfolds. Subsequent erosion removed from the higher parts of the uplands the Coal Measures, which lay on top, though along the flanks of the Pennines they still remain (Fig. 110).

The Pennines may be divided into three regions.

(1) The *Northern Pennines* consist of a block of table-land cut off by faults in the north, west, and south. On the north the plateau drops to the Tyne Gap; on the south it is margined by the Stainmore Gap; and on the west it sinks through the magnificent scarp of Cross Fell Edge to the Vale of Eden. On the east a more gradual slope is drained to the North Sea by the South Tyne, Wear, and Tees, which flow across the Northumberland and Durham coal-field. The rocks are chiefly sandstones, with Millstone Grit mantling the higher summits, and spreading along the east and west of the uplands.

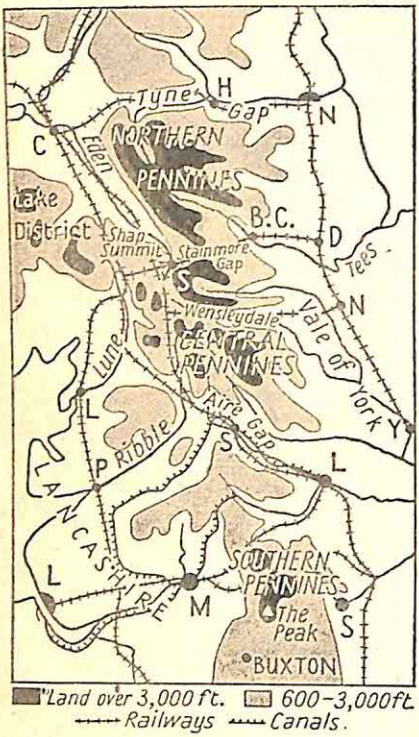


FIG. 111. The Pennines.

(2) The *Central Pennines*, consisting mainly of limestone, extend from Stainmore Gap to the Aire Gap. On the west this wild table-land is bounded by the Dent Fault: on the east it slopes gradually to the plain, but it should be noted that in this part of the Pennines no Coal Measures are found along the flanks of the uplands. From the Central Pennines the Ribble and Lune run west, while on the east numbers of streams flow through verdant dales to the Yorkshire Ouse.

(3) The *Southern Pennines* stretch from the Aire Gap to the Vale of Trent. South of the Aire Gap, where the Millstone Grit moorlands form the narrowest part of the Pennines, the heads of the valleys approach each other, and communications between east and west are easier than in the broader and higher belt farther north. The Southern Pennines are highest in the limestone Peak District, whence streams descend in deep trenched valleys to the Trent. The

Lancashire and North Staffordshire coal-fields lie to the west and the York–Derby–Nottingham coal-field to the east of the Southern Pennines.

The regular and heavy rainfall, the elevation, and the nature of the rocks make the Pennine Moorlands unsuited to cultivation. In the limestone districts underground streams, swallow holes, caves, steep valleys, and other land-forms combine to form scenery of the *karst type*. Some of the limestone is dissolved by the streams, causing the water to be 'hard'. The thin soil is covered with short fine grass on which stock are grazed in fields separated by stone walls.

In the Millstone Grit areas layers of peat cover flat-topped hills whose slopes are clad with heather. These moorlands are practically uninhabited, 'but they send down to the bordering lowlands an abundance of soft water which has been an important factor in the development of the textile industries on their flanks'.[1] Rain-drenched and bleak, their waters are collected in reservoirs to supply the manufacturing towns of Lancashire and Yorkshire.

The dale farmers are mainly stock breeders pasturing their animals on the uplands during the summer, and sending cattle to be fattened on the lowlands. Sheep, ten times more numerous than cattle, whose presence did much to establish the woollen industry in Yorkshire, are now bred for meat rather than wool.

Except on the margins of the coal-fields there are no large towns in the Pennines. Hexham and Skipton are focal points in the Tyne and Aire Gaps respectively. Buxton and Matlock are spas noted for the curative value of their waters.

The Lake District. The Lake District has been aptly compared to an inverted spoon with a broad handle: the dome of the spoon represents the much-denuded Cumbrian mountains, the handle is the high ground of Shap Fell which links this region with the Pennines. Much of the central portion of the Lake District is composed of old sedimentary rocks with granites and slates, both of which are quarried. This area is margined by lowlands composed of younger rocks. In the north-west are the Coal Measures of the *Cumberland coal-field* (Maryport, Workington, and Whitehaven); in the south-west are found Permian and Triassic rocks; while a belt of Carboniferous Limestone margins the older rocks on the south, east, and

[1] *Great Britain: Regional Essays*. Cambridge University Press.

north-east, which contains 'pockets' of high-grade iron ore (smelted over coke from the Northumberland and Durham coal-field) to whose presence is due shipbuilding at *Barrow-in-Furness*.

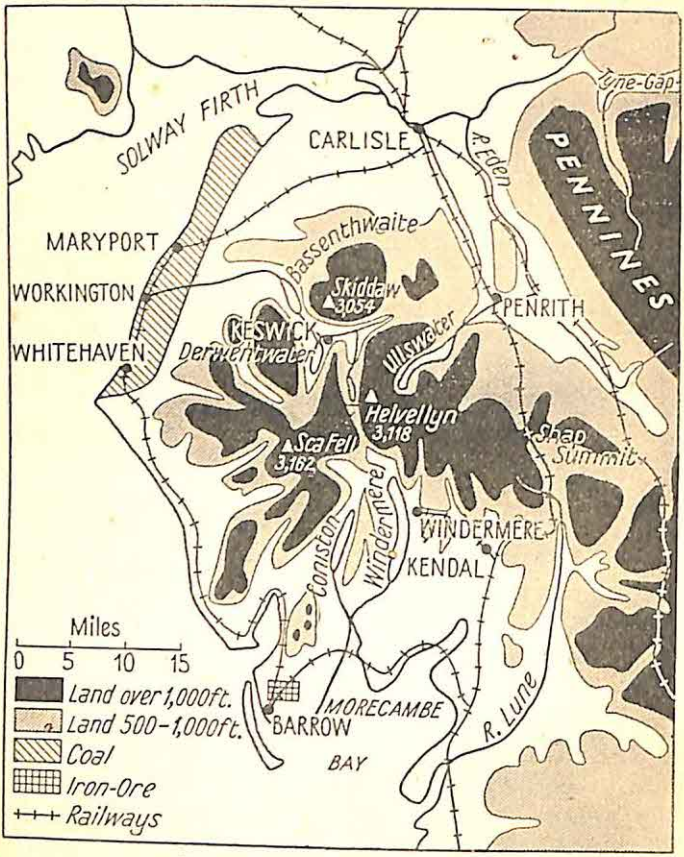


FIG. 112. The Lake District.

The mountain dome of the Lake District culminates in Scafell Pike (3,210 feet) whose sides, seamed with valleys carved deep by former glaciers, are now being eroded by numbers of streams that radiate in all directions. Many of these streams expand into long narrow *mountain ribbon lakes*, partially blocked by deposits of moraine material at their lower ends. Among the chief of these beautiful lakes are Ullswater, drained to the Eden; Thirlmere (one of the

reservoirs of Manchester); Derwentwater and Bassenthwaite, separated by an alluvial strip formed by the sediment deposited by rivers checked on entering the once-united lake; Crummock Water (the reservoir of Workington); and Windermere and Coniston draining into Morecambe Bay. The climate of this region is too wet for cereals, but many sheep are grazed on the *fells*, and cattle in the valleys.

The few inland towns are market centres with some small-scale manufactures. Kendal makes woollen goods and boots; Keswick 'lead' pencils, though it no longer uses local plumbago (black-lead), but imports it from Spain and Canada, together with cedar from Florida.

The *London Midland and Scottish Railway* after leaving Lancaster ascends the Lune valley, crosses Shap Summit at a height of 1,000 feet, and then descends to the market town of Penrith. The Midland section of the same railway group after ascending the upper Ribble valley crosses to the Eden, which it follows to Carlisle, a city commanding routes north to Scotland and east through the Tyne Gap to Newcastle.

The Cheshire and Lancashire Plain. From the western slopes of the Pennines and the north-eastern slopes of the Welsh Uplands the Cheshire and Lancashire Plain—a prolongation of the main English Plain—stretches to the Irish Sea, to which it is drained by the Dee, Weaver, Mersey, and Ribble. The greater part of this lowland is covered with boulder clay, though, here and there, the underlying red sandstone emerges as low hills. Both the moist climate and the clay soils favour pasture; thus outside the industrial areas dairying, with a market ready to hand, is the leading occupation.

The economic development of this region depends on the South Lancashire coal-field extending along the western flanks of the Pennines, which is the seat of the principal cotton-manufacturing area in the world. A number of factors have contributed to the centralization of the cotton industry in Lancashire, where its rapid development dates from the time when steam replaced running water as a means of power. As in many other districts, the cotton industry superseded an earlier woollen one: thus when, about the middle of the eighteenth century, cotton began to be imported from America, the spinners and weavers easily changed from wool to cotton. But the *human factor*, and a *good position for American trade*,

do not alone account for the location of the cotton industry in Lancashire. In addition to *coal*, other things have played an important part in the advancement of the industry—ample supplies of *pure soft water* and a *damp climate*. Soft water is required in various pro-

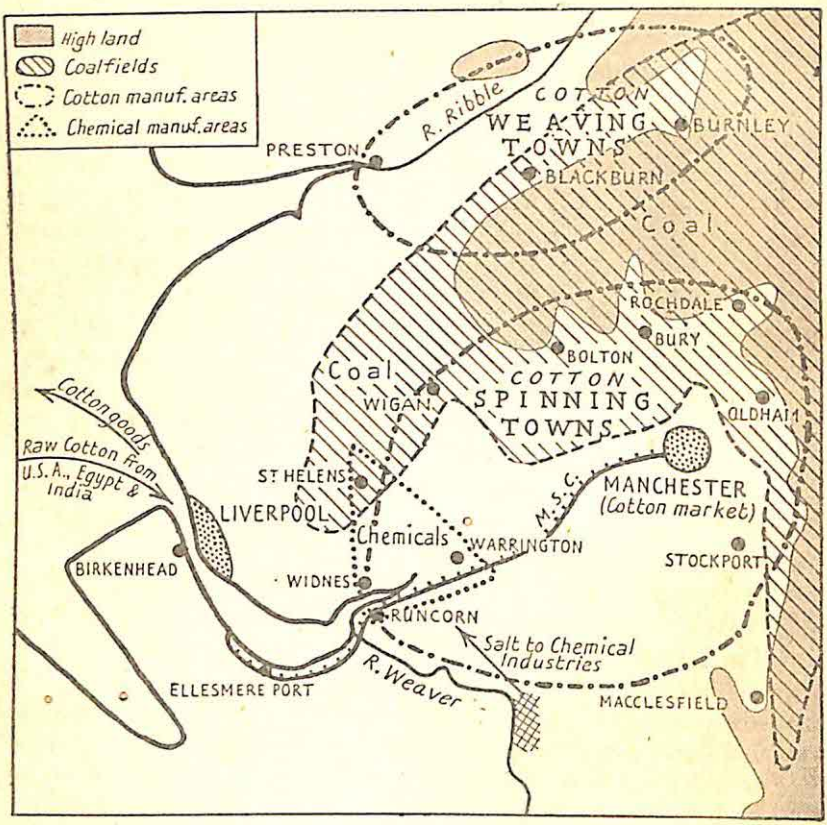


FIG. 113. The Lancashire industrial area.

cesses connected with the manufacture, and for this reason the mills are situated on the margins of the Millstone Grit areas. In a dry climate cotton threads tend to snap in the looms, so it is advantageous for cotton-spinning mills to be situated in damp regions, like those on the west side of the Pennines, where the atmosphere is humid.

The chief towns associated with the cotton industry are Manchester and Liverpool. *Manchester* (736,000), standing on a strip of firm

ground at a point where many routes meet, has developed from a rural town into the great cotton market of Lancashire. By the construction of the *Manchester Ship Canal*, 35 miles long, this inland city has been made a port, but though much raw cotton is shipped direct to Manchester, more than three times the amount is still unloaded at Liverpool—an interesting example of *geographical inertia*.

Most of the Lancashire towns specialize in some particular branch of the cotton industry. The spinning towns of Stockport, Oldham, Bolton, and Bury are grouped round Manchester. In the more sheltered and drier region to the north, Preston, Burnley, Blackburn, and Darwen are engaged in weaving. After the cloth has been woven it is sent to be bleached, dyed, and 'finished' in South Lancashire. These operations are dependent on the chemical manufacturing towns of St. Helens, Widnes, Warrington, and Runcorn, which are conveniently placed both for obtaining salt from the works at Northwich, Middlewich, and Winsford in the Weaver basin; and also for importing by sea other heavy and bulky materials needed by their chemical industries; especially those required for making alkalis used in the preparation of carbonate of soda. Large quantities of the latter product are required by the soap (Warrington) and glass (St. Helens) manufacturers. The Cheshire town of Macclesfield is noted for the manufacture of silk.

Engineering of various types is carried on. Oldham, Manchester, Blackburn, Bolton, and Bury make textile machinery; Manchester and its twin city of Salford are also important centres for general engineering.

Enormous quantities of paper are required by the many Lancashire industries, and numbers of paper-mills are situated in the Millstone Grit valleys around Manchester. Other industries include the manufacture of bricks and tiles from the shales and clays of the Coal Measures; flour-milling at Liverpool (why at a port?), and sugar- and oil-refining.

The early trade of *Liverpool* (840,000) was mainly with the West Indies (cane sugar) and North America. Together with Birkenhead it forms a single commercial unit, linked by ferries and a railway and road tunnel under the Mersey. Continuous dredging has deepened the entrance to the bottle-shaped estuary through which the largest liners can pass to anchor at the floating stage, nearly a mile long, that rises and falls about 20 feet with every tide. London and Liverpool

handle between them half of Britain's overseas trade. Liverpool's imports include cotton, tobacco, and petroleum from the United States; bananas and cane sugar from the West Indies; palm oil, palm kernels, cacao, and copra from West Africa; wheat from Canada, meat from the Argentine, and wool from Australia. Her extensive hinterland furnishes a variety of manufactured goods the bulk of which furnish return cargoes to the primary producing lands. Chief among these exports are cotton, woollen, and linen goods, machinery, chemicals, and pottery.

Most Lancashire towns owe their importance to manufactures, but one large town does not. It is *Blackpool*, most of whose 110,000 inhabitants earn their living directly or indirectly by providing pleasure for crowds of holiday-makers. *Lancaster* stands where the route to Scotland crosses the Lune, but like its sister county town of Chester it cannot compare in size with the industrial centres. Chester is a market centre for the pastoral districts of the Cheshire Plain. The railway junction of *Crewe*, to the south-east, owes its importance to its central position in the Midland Gate, through which pass the chief routes from North-West England and North Wales to the south.

Yorkshire. The waters of the Swale, Ure, Nidd, Wharfe, Aire, and Don, descending from the Pennines, are carried by the Ouse to the Humber estuary. The only left-bank tributary of the Ouse is the Derwent, which once flowed into the North Sea, but during the Ice Age its outlet was blocked back by glacial material and the river was diverted to the Ouse.

Outside the Pennine Moorlands Yorkshire falls into three main divisions: (1) the coal-field extending along the flanks of the Pennines, (2) the New Red Sandstone and alluvial plain of the Vale of York, and (3) the Scarplands of the Vale of Pickering, drained by the Derwent.

(1) The *Yorkshire coal-field.* The sheep grazed on the Pennine moorlands, and the abundant supplies of water-power furnished by the upland streams, gave rise to the woollen industry in the Yorkshire dales. The Industrial Revolution, and the consequent development of the coal-field, led to the closing of mills outside the coal area, and their concentration in the Aire and Calder valleys where plentiful supplies of pure water were available. *Leeds* (490,000), the chief

woollen manufacturing town, is noted for ready-made clothes, and also for textile machinery and motor-wagons. It commands a number of routes, including those through the Aire Gap. *Bradford*, to the west, is the great wool market; *Halifax*, in the Calder valley, is noted for carpets; Dewsbury and Batley, lower down the Calder valley, specialize in 'shoddy' (goods made from worn-out fabrics).

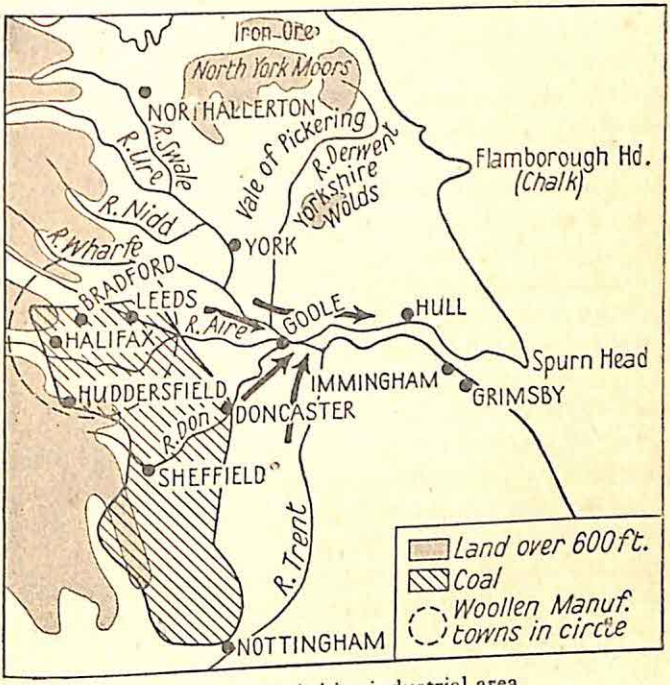


FIG. 114. Yorkshire industrial area.

In the south of Yorkshire stands *Sheffield* (520,000), on the Don. Local supplies of iron ore, limestone, charcoal and later coal, Millstone Grit, and water-power combined to establish the cutlery industry here; and though conditions have changed, Sheffield still ranks as one of the leading iron and steel manufacturing towns in Britain. Farther down the Don valley stands Doncaster, a coal-mining centre which manufactures locomotives.

(2) and (3) The *Vales of York and Pickering*. The mixed glacial material covering much of the underlying New Red Sandstone of the Vale of York yields fertile soils on which wheat, barley, oats, and

roots are grown. Cattle are grazed on pastures like those of the Vale of Pickering, and sheep on the chalk and limestone hills.

In the centre of the plain stands the cathedral city of *York*. Like other ancient route towns it has become an important railway junction. *Hull*, the chief port of North-East England, stands on the left bank of the Humber estuary. Its imports include wheat, wool, meat; butter and petroleum; oil-seeds, timber, and pit-props; its exports cotton and woollen goods, coal, and iron and steel goods. As a fishing port it is not so important as Grimsby which, like Immingham, a coal-exporting port, stands on the Lincolnshire bank of the Humber. Scarborough is a sea-side resort.

Northumberland and Durham. Northumberland and Durham, with the Cleveland District of Yorkshire, constitute a well-defined region stretching from the North Sea across a narrow plain to the Pennine Moorlands. The way from the south comes through the Northallerton Gate and thence across the lowlands to Newcastle, where it divides. One branch continues north to Scotland, passing through the narrow strip between the Cheviots and the sea; the other runs west through the Tyne Gap to Carlisle and the Solway plain. Of the 2,000,000 people who live in this region nearly all dwell on the plain, and few inhabit the moorlands whose pastures form part of a vast sheep-run stretching south into Derbyshire and north to the Southern Uplands of Scotland.

The great *Northumberland and Durham coal-field* stretching along the margin of the Pennines extends from Barnard Castle, in the south, to the coast in the north, where it is cut by the valley of the Tyne. Coal, close to the sea, iron ore from the Cleveland Hills, and limestone are the basis of coal-mining, engineering, and shipbuilding; and deposits of salt of the chemical industries of Tees-side.

On the estuary of the Tees lie Middlesbrough and Stockton, with Hartlepool a little to the north. *Middlesbrough* is an important iron-smelting centre, and so great is the demand for ores that supplies from the adjacent Cleveland Hills (Yorkshire) are insufficient, and ores are imported from Sweden, Northern Spain, and Algeria. In its workshops steel bridges and steel rails are also made. *Darlington*, higher up the Tees valley, is noted for its forges and locomotive shops. *Sunderland*, on the Wear, is a coal-exporting and shipbuilding port. The Tyneside ports of North and South Shields, Tyne-

mouth, Jarrow, Gateshead, and *Newcastle* depend for their prosperity on the presence of coal lying close to river and sea. Jarrow manufactures chemicals, while Newcastle has engineering and chemical works and shipyards. Newcastle apart, most of these northern towns

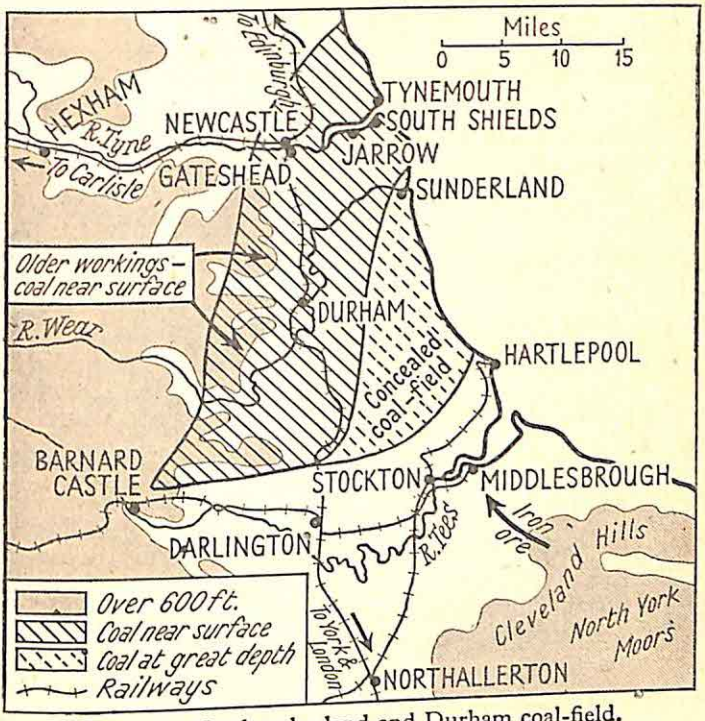


FIG. 115. Northumberland and Durham coal-field.

are of comparatively recent origin compared with *Durham*, whose Norman cathedral and castle, standing on a rocky bluff, almost encircled by the Wear, are reminders of its historic past.

The Southern Uplands of Scotland. The Southern Uplands, consisting of rounded moorlands separated by river valleys, stretch from the Cheviots northward to the Midland Valley, and from the North Sea to the west coast. They descend to lowlands along the shores of the Solway Firth, in the basin of the Tweed, and in Clydesdale which opens to the Midland Valley.

Sheep, bred on the treeless moors, provide wool for factories of such towns as Hawick on the Teviot, and Galashiels, at the confluence of the Tweed and the Gala. The valleys are a patchwork of woodland, pasture, and ploughland where cereals and root crops are grown. The Southern Uplands as a whole are thinly peopled,

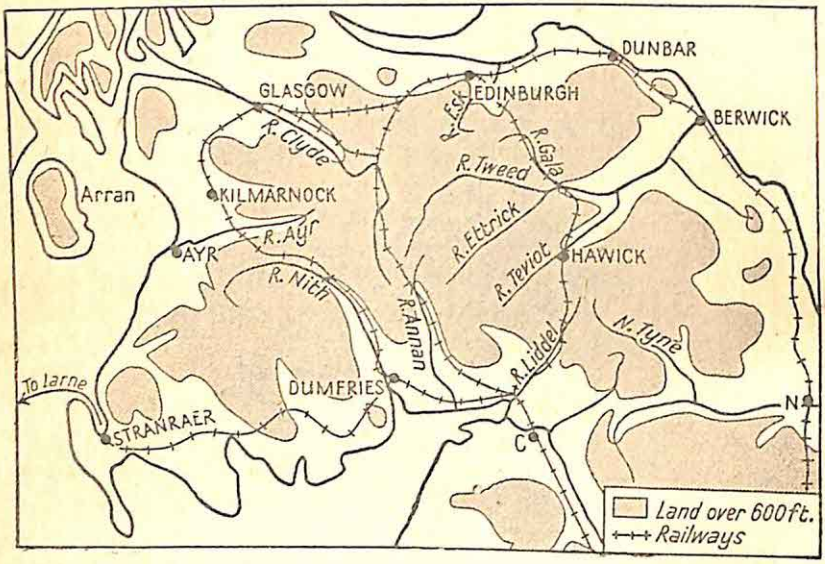


FIG. 116. Scotland: The Southern Uplands. Routes between England and Scotland.

settlement being almost confined to the valleys and marginal lowlands.

The chief railways from England to Scotland pass through either Carlisle or Newcastle. Study the following routes with the aid of your atlas, for they provide a key to the configuration of the Southern Uplands. From Carlisle routes run: (1) to Dumfries and thence up Nithsdale to Kilmarnock and Glasgow; (2) to Dumfries and then west to Stranraer, for Larne in Northern Ireland; (3) up Annandale and over Beattock Summit to Carstairs, where one route follows Clydesdale to Glasgow, and the other runs north of the Pentland Hills to Edinburgh; (4) north-east to the Tweed by the valley of the Liddel to Hawick, on the Teviot, and thence to Galashiels and by way of the Gala valley to Edinburgh. The main east-coast route

from Newcastle runs to Berwick-on-Tweed and, skirting the eastern end of the Lammermuirs, passes through Dunbar to Edinburgh.

The Midland Valley. This well-defined natural region is a rift valley having an average width of 50 miles. It lies between two roughly parallel faults: one running from Helensburgh, on the Clyde, to Stonehaven marks the southern edge of the Highlands, the other

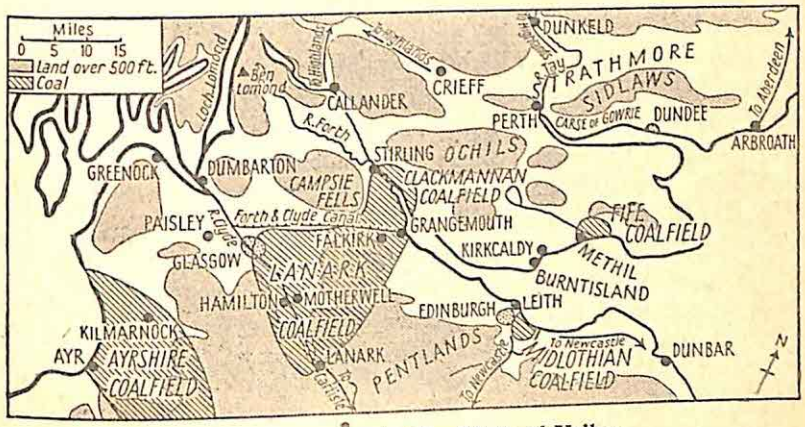


FIG. 117. Scotland: The Midland Valley.

extending from Girvan to Dunbar delineates the northern boundary of the Southern Uplands. When the rift valley was formed, masses of molten rocks reached the surface through volcanoes, or spread out in lava flows over the land. The much-denuded volcanoes still remain as cone-like hills (e.g. Castle Rock, Edinburgh) rising above the sedimentary rocks (Old Red Sandstone and Carboniferous Limestones) that floor the plain. The lava flows formed belts of rounded hills running roughly parallel to the great boundary faults. The more northerly ridges are the Sidlaws, Ochils, Campsie Fells, and Renfrew Heights; the more southerly include the Pentlands and the Lanark Moors. Between the Sidlaws and the edge of the Highlands is the broad Old Red Sandstone Vale of Strathmore, while between the Sidlaws and the Firth of Tay lies the Carse of Gowrie. The drowned estuaries of the Firths of Tay, Forth, and Clyde which extend into the heart of the Midland Valley provide valuable outlets to the sea.

There are five coal-fields: (1) the Lanark field whose seams emerge

across the head of the Forth estuary as the (2) Clackmannan field; (3) the Ayrshire field; and (4) the Midlothian field which extends under the Firth of Forth to reappear as (5) the Fife field.

Of the 5,000,000 people in Scotland three-quarters live in the Midland Valley where, outside the coal areas, farming is the principal occupation. Cattle are bred on the Ayrshire Plains, which have a fairly heavy rainfall; sheep on the slopes of the hills. Oats, potatoes, and other root crops are widely grown, but barley and wheat are confined to the drier, sunny east. There are a number of small fishing and tourist centres around the coast.

The Lanark coal-field and the Lower Clyde. The Lanark field stretches from Glasgow south-east to Lanark, and eastward to the north side of the Forth estuary. Grangemouth, at the eastern end of the Forth and Clyde Canal, is a coal-exporting port. In addition to coal blackband iron-stone occurs in the shales of the Coal Measures, and, though at the present time little is mined (most of the iron ore being imported), it was the presence of this iron-stone and coal, in proximity to the Clyde, that caused that river to become one of the leading shipbuilding areas in the world. At inland centres on the coal-field, such as *Motherwell* and Hamilton, general engineering is carried on.

The life of the coal-field is centralized in *Glasgow* (1,000,000). A number of routes converging on the city early made it important, but it was not until the Clyde was embanked and deepened that it became an important port. Among its industries are general engineering, the manufacture of cotton goods (compare the climate with that of Lancashire) and chemicals, and sugar refining. Important shipbuilding ports are Clydebank, Port Glasgow, and *Greenock*, the last named also refining sugar. Dumbarton uses the pure waters of Loch Lomond for bleaching; while *Paisley* is noted for cotton thread. Kilmarnock, on the Ayrshire coal-field, has engineering works, and Ayr and other ports on the Firth of Clyde export coal to Belfast.

Edinburgh (420,000) is the only large town on the small Midlothian coal-field. The capital of Scotland grew up around the castle-crowned rock standing in the gap between the Pentlands and the sea. Its industries include brewing, printing, and publishing (compare Oxford). Edinburgh was partly responsible for the growth of the paper-making industry in the valley of the Midlothian Esk, where the mills now use wood pulp imported from Sweden. Leith, the port of

Edinburgh, imports dairy produce, wood pulp, and timber, while its exports include coal and pickled herrings which are in great demand in the Baltic lands. Routes to the north run along the side of the Firth of Forth to Stirling, placed in the gap between the Ochils and the Campsie Fells. The modern railway crosses the Forth above Edinburgh and passes through Dunfermline, on the edge of the *Fife coal-field*, where Methil and Burntisland are coal-exporting ports and Kirkcaldy manufactures linoleum, using imported jute, linseed oil, and cork. Perth, in the gap between the Sidlaws and the Ochils, rose up at the lowest spot where the Tay was bridged. Here the route from the south-west divides: one branch crosses the Vale of Strathmore—a farming region—the other traversing the fruit-growing district of the Carse of Gowrie to Dundee. Once mainly a fishing port, *Dundee* (170,000) is now an engineering and manufacturing centre, making linen, sacks, bags, and sail-cloth with jute from India; marmalade and jam. From Dundee the railway to Aberdeen runs through Arbroath, a linen-manufacturing town, Montrose, and Stonehaven.

The Highlands and their Margins. As seen from the Midland Valley, the great boundary fault running from Helensburgh to Stonehaven resembles a mountain range. North-west of it are the Highlands, the most extensive upland area in Britain. They are built up of old hard, crystalline rocks, mainly granites, schists, and gneisses that have weathered to form a poor infertile soil. The Highlands are the remnants of an ancient plateau, trenched by deep valleys that divide it into rounded masses of fairly uniform height. The general south-west to north-east direction of the valleys is well seen in Glenmore, a narrow rift, whose lochs are linked to form the Caledonian Canal, only large enough for the passage of small steamers. Glenmore divides the North-West Highlands from the Grampians, which culminate in Ben Nevis, 4,400 feet, the loftiest peak in the British Isles. On the west the Highlands extend to a rugged island-fringed coast whose glaciated valleys, filled by the sea, resemble in structure and appearance the fiords of Norway (Fig. 118, p. 173). From the water-parting which lies close to the west coast short swift streams, fed by heavy rains, descend to the sea-lochs and firths opening to the Atlantic, and longer streams to the eastern seaboard. Among the latter, whose valleys are utilized by railways, are

the Tay, Dee, Don, and Spey. Owing to the remoteness of the Highlands from populous regions, little use is made of the abundant water-supplies, though in a few places, like Kinlochleven and Foyers, local water-power is used to generate electricity for aluminium factories.

Lying in the track of the on-shore westerlies, the Highlands have a heavy rainfall, especially in the west; while on account of their northerly latitude and elevation their climate is bleak and cool. There is little cultivation. Here and there, in some mountain glen, may be seen a plot of oats planted near the home of a crofter, whose two-roomed dwelling is built of stone gathered from the rock-strewn land, and thatched with heather from the moor. Thousands of acres are devoted to sheep walks, and also to deer 'forests', grouse moors, and salmon streams usually let by their owners to wealthy sportsmen. The extensive stretches of forests have in recent years been enlarged by systematic re-afforestation undertaken by the Government. It is not surprising that the Highlands are one of the most sparsely peopled areas in Europe. In the whole of this region, with its beauty of mountain and moor, deep-set loch and tumbling stream, there are few villages and no towns of any size. Oban, the largest, has less than 6,000 inhabitants. From Fort William, at the south-west end of Glenmore, the railway is continued to Mallaig, which, like the Kyle of Lochalsh farther north, is a terminus and a port for the Hebrides.

In the Highland region must be included the Western Isles, whose wild and rugged slopes rise high above storm-tossed seas. The islands may be divided into the Inner and Outer Hebrides, separated by the Minch, a submerged rift valley. Chief among the Inner Hebrides are Mull and Skye, built mainly of igneous rocks which form the Cuillin Hills in Skye, and rise in terraces on both sides of the Sound of Mull. Portree is the chief town in Skye.

The principal island in the Outer Hebrides is *Lewis and Harris*, from whose port of Stornoway steamers run to the Kyle of Lochalsh. The island-crofters grow oats and other crops for their own use, breed a few cattle, and rear sheep whose wool is made into homespun cloth like 'Harris tweeds'. There is some fishing, but an attempt some years ago to establish a modern fishing industry was a failure.

The Orkneys and Shetlands are more closely linked with North-East Scotland. The *Orkneys* are separated from the mainland by Pentland Firth, through which tidal currents race at great speed, making navigation difficult. Forming a detached portion of the

Old Red Sandstone Plain of Caithness, the islands are relatively low. Sheep are pastured and some fishing is carried on. There is a summer air service from Kirkwall, on the island of Mainland, to Aberdeen.

The rugged *Shetland group*, some 50 miles north of the Orkneys, resembles the Highlands in structure and scenery. Sheep grazed on

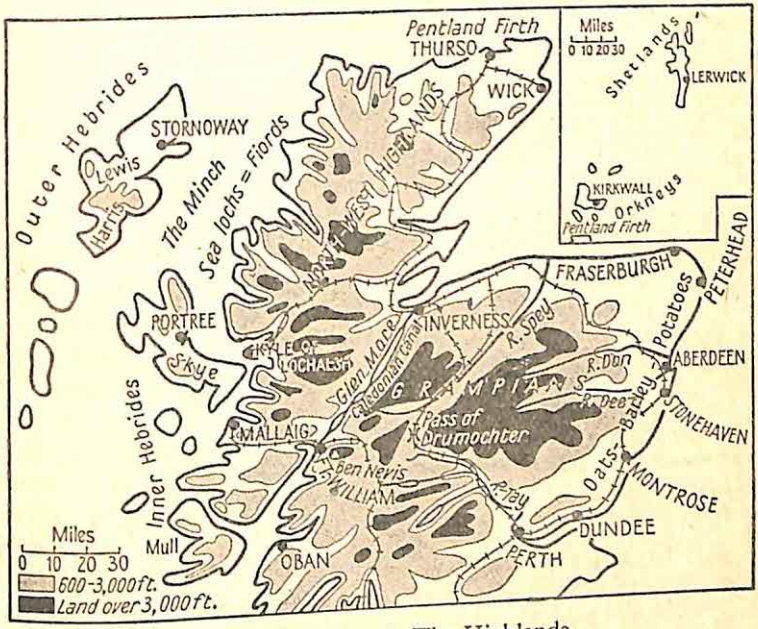


FIG. 118. Scotland: The Highlands.

the moorlands yield fine wool. Lerwick, the chief town, is a small fishing port.

Nine-tenths of the inhabitants of Northern Scotland live on the *North-East Coastal Plain* which margins the Highlands on the east. Lying in the rain shadow of the mountains, the plain has a relatively low rainfall. The sandstone weathers to a rich soil on which oats, barley, and root crops are grown and on whose pastures shaggy, horned cattle are reared. *Aberdeen* (176,000), situated at the point where the Dee and Don valleys reach the coast, is a university town, and one of the chief fishing ports in the British Isles. Other fishing centres are Peterhead and Fraserburgh, somewhat to the north, and Wick, in Caithness. Inverness, lying at the northern end of

Glenmore, is the chief centre of the Moray lowlands, composed like the Plain of Caithness of Old Red Sandstone.

The Isle of Man. In the Irish Sea, almost midway between England, Scotland, Wales, and Ireland lies Man (230 square miles), a mountainous island (Snaefell, 2,030 feet) which in structure and relief closely resembles the Wicklow Mountains and the Welsh Uplands. The Curragh, in the north, is the only considerable lowland area. Owing to its maritime situation the climate is mild. Oats, barley, potatoes, and turnips are the chief crops; sheep are pastured on the moorlands and cattle are reared; there is a little lead mining and some fishing is carried on round the coasts. But the chief occupation is catering for visitors, especially those from the industrial north, who in summer flock to this island with its picturesque glens, pleasant beaches, and heather-clad moors. *Douglas*, the capital and chief sea-side resort, is linked by rail with Ramsey in the north-east, Castletown in the south, and the quaint old port of Peel in the west. From Douglas steamers run to Liverpool and Heysham, while air services link it with Liverpool, Carlisle, and Dublin. Man is administered in accordance with its own laws by the Court of Tynwald.

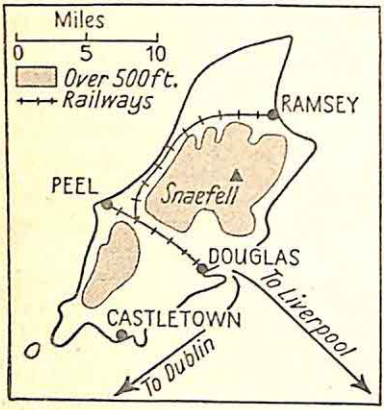


FIG. 119. The Isle of Man.

EXERCISES

1. Name and account for the position of the chief shipbuilding areas in the British Isles. Describe *one* of them in detail.

2. Give an account of *one* of the following routes, paying attention to the type of scenery and industry: railway from London to Fishguard; the Great North Road from London to Darlington.

3. (*a*) Why has South-West England so favourable a climate? (*b*) What branch of agriculture depends mainly on the climate? What other industry depends on the climate and scenery?

4. (*a*) Give an account of the relief, climate, and occupations of the English Lake District. (*b*) Name four British lakes used as reservoirs, mentioning in the case of each the towns they supply.

5. State briefly some of the main factors that have contributed to the importance of Shrewsbury, Sheffield, Birmingham, Edinburgh, Carlisle, and Oxford. Illustrate your answers by sketch-maps.

6. How do you account for the location of the cotton industry in Lancashire? From what countries does this country obtain its raw cotton? Name (i) the chief port, (ii) the chief cotton market town, (iii) *three* spinning and *three* weaving towns, and *three* engaged in bleaching and dyeing, accounting for the location of *one* in each group.

7. (*a*) Describe briefly the geographical factors influencing the position of large commercial ports. (*b*) Name *two* such ports in England, *one* in Wales, and *one* in Scotland. Describe the position of each and outline its hinterland. In the case of each port name *two* of its chief exports, and *two* imports together with *one* source from which each is obtained.

8. Describe carefully the relief and drainage of the Pennine Chain, indicating any important gaps in that upland.

9. Three men, A in the lowlands of South-West Scotland, B in Norfolk, and C in Kent, each make their living by farming the land, but their work is not necessarily the same. Suggest, giving your reasons, the differences in the types of farming.

10. Name *two* coastal districts in England and *one* each in Wales and Scotland which are popular holiday resorts. Give a description of *one* only of those you name, and state to what geographical conditions you ascribe its popularity.

11. There are many islands round the coasts of Britain. (*a*) Name *one* of the more important ones in the Irish Sea, *one* in the English Channel, and *one* off the west coast of Scotland. (*b*) Select *one* of these islands and show how its position, relief, and climate are related to the occupations of the inhabitants. Describe briefly the land- and water-route by which you would travel to the island from your own home.

12. Illustrating your answer from the British Isles, discuss the best position for a commercial airport. Name the airports in England from which you could fly by a regular service to (*a*) Paris, (*b*) Oslo, (*c*) the Channel Islands, and (*d*) the Isle of Man. (Consult an Airways Time-Table.)

13. (*a*) Name the five chief towns in the Potteries. (*b*) Whence do the Potteries obtain the following raw materials for their main industry: coal, china clay, and flints? How are the last two materials conveyed to the Potteries? Name one other place in the British Isles engaged in making pottery.

14. Show by sketch-maps the traffic routes by which manufactures of the Black Country reach the following ports: Liverpool, Grimsby, London, Bristol.

15. What are the chief occupations of the people living (i) along the Eastern Plain of Scotland, and (ii) in the Highlands? How do you account for the sparse population of the latter region?

16. Name the chief woollen manufacturing areas in Great Britain, *outside Yorkshire*, and account for their location. From what countries do we import most of our raw wool? Name *two* of the chief ports of entry.

17. What do you mean by the London Basin? Give a short account of the basin with special reference to the position of London.

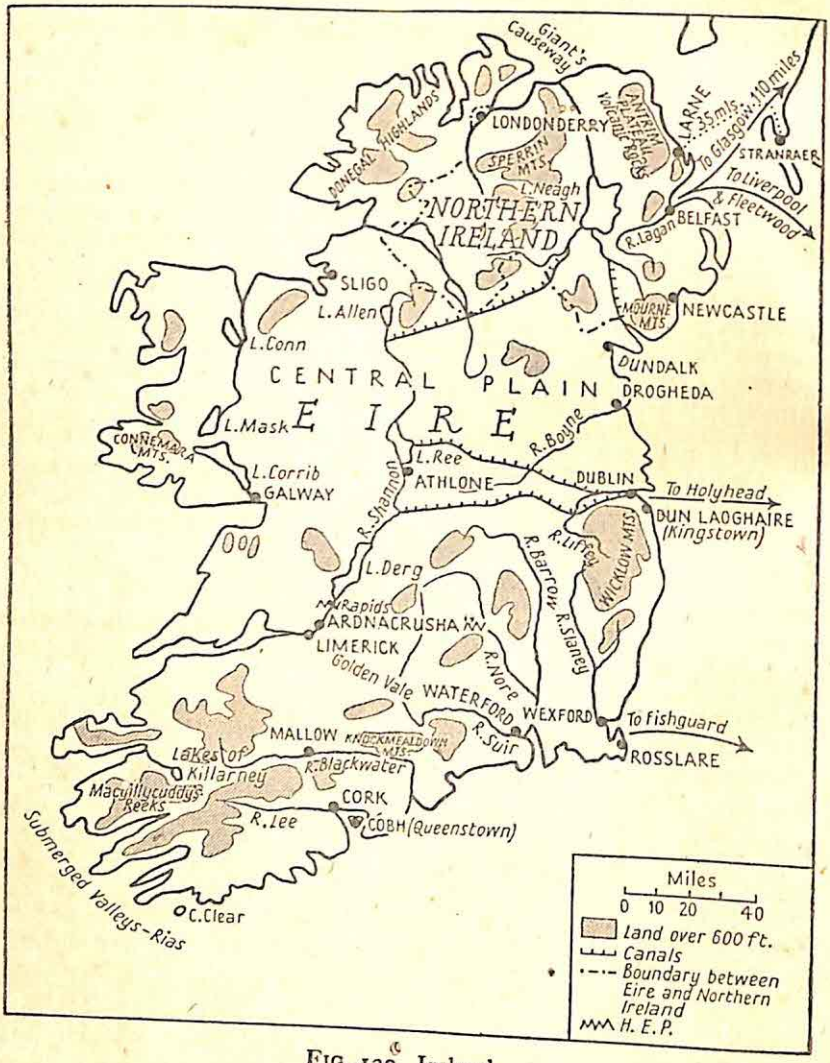


FIG. 120. Ireland.

IRELAND

Ireland consists of a much-denuded Central Plain surrounded by groups of relatively low mountains many of which display striking structural resemblances to the ancient highland areas of Britain. In Connaught the Connemara Mountains are separated from those of Mayo by Clew Bay. To the north-east the Donegal Highlands rise from the sea to a height of 1,900 feet. Between the Donegal Highlands and the Sperrin Mountains the Foyle flows northward into the lough that bears its name. To the east of the Sperrin Mountains lies the valley of the Bann, draining Lough Neagh, the largest lake in the British Isles. North-east of the lowlands drained by the Bann and the Lagan is the Antrim Plateau, whose steep cliffs, composed of chalk covered with basaltic rocks, rise high above the waters of the North Channel separating Ireland from Scotland. The volcanic rocks of the Antrim Plateau were formed at the same period as those of Western Scotland. In the Giants' Causeway the basaltic lava has cooled into regular columns.

North-west of the granitic Mourne Mountains, which resemble in their structure and direction the Southern Uplands of Scotland, lies the valley drained by the Blackwater to Lough Neagh. In this valley, a continuation of the Rift Valley of Midland Scotland, lies the small Tyrone coal-field. South of the Liffey the Wicklow Mountains rise in Lugnaquilla to over 3,000 feet. In geological age, structure, and landscape these beautiful uplands resemble the Welsh Highlands on the opposite side of the Irish Sea, and like the latter they have been glaciated and contain numbers of U-shaped valleys and cirques.

In Southern Ireland a well-marked series of upfolds (anticlines) and downfolds (synclines) form parallel ridges and valleys running from east to west. To the north of the upfold forming the Knockmealdown Mountains the Suir runs east in the corresponding downfold to Waterford Harbour, into which the united waters of the Nore and the Barrow also flow from the north. The Bandon, Lee, and Blackwater flow east in similar valleys, but in their lower courses they turn south, flowing through transverse gorges into rias which form respectively the harbours of Kinsale, Cork, and Youghal. In the south-west other rias form Dingle Bay, Kenmare Bay, and Bantry Bay. Unlike the sea-lochs (fiords) of Scotland, the banks of the rias

are gently sloping, becoming narrower and shallower towards their heads. The coast is fringed by numerous islands, including Valencia Island, whence cables run across the Atlantic, and Cape Clear Island, with its lighthouse. Between Dingle Bay and Kenmare Bay rise the Macgillycuddy's Reeks, the highest mountains in Ireland, at whose foot nestle the picturesque island-studded Lakes of Killarney.

The *Central Plain* covers one-third of Ireland, and though ringed by uplands it extends to the sea in many directions. On the east is the broad entry of Meath. On the west the lowlands reach the Atlantic round the Shannon estuary, at the heads of Galway, Clew, Killala, and Sligo Bays, and along the valley of the Erne. On the north-east other routes lead seawards along the lowlands drained by the Foyle, Bann, and Lagan.

The plain is floored with limestone covered for the most part with boulder clay deposited by the Ice Sheet. The copious rains leave much surface-water, some of which collects in clay hollows, forming swamps and shallow lakes, where peat moss and other damp-loving plants thrive. This process has been going on for thousands of years: as plants have died they have been replaced by others, and gradually the mass of vegetation and mud has formed a *bog*. The decayed vegetation which in the course of ages has accumulated in the bogs forms peat, which may be regarded as a half-way stage to coal. With the exception of the Bog of Allen, most of the Irish bogs have been drained, thus allowing the peat to be cut for fuel. The plain is dotted with small *morainic dammed lakes*, while in places the streams have expanded into *solution lakes*, formed by the dissolution of the soluble limestone. Among them are loughs Conn, Mask, and Corrib, and those through which the Shannon flows.

The Shannon (250 miles), the longest river in the British Isles, rises in the North-West Highlands, and flows through Lough Allen, Ree, and Derg, past Limerick into a broad estuary. From the point where it leaves Lough Allen to the southern end of Lough Derg, the Shannon falls only 60 feet in some 80 miles, or 9 inches per mile. But between the latter lough and Limerick the river cuts its way through a gorge, falling over 100 feet in 20 miles. The building of a canal has enabled the fall of water to be utilized by the Ardnacrusha power-station, which supplies much of Eire with electricity.

Though Ireland is geographically a unit, yet, on account of historical considerations, it has been divided into two states each with its own Parliament: *Eire* and *Northern Ireland*. As regards its external affairs the former ranks as a Dominion of the British Commonwealth of Nations. Northern Ireland forms an integral part of the United Kingdom.

Eire. Eire, formerly the Irish Free State, comprising about five-sixths of Ireland, has a population of nearly 3 millions. It is primarily an agricultural country, for it has few minerals and only one small coal-field in Kilkenny. But thanks to the abundant electricity supplied by the Shannon Power Station, and to government aid, a number of local industries have been established.

The damp climate, though excellent for grass, is unsuited to wheat. Oats and potatoes are widely grown, and barley is cultivated in the dry, sunny, warm south-east. The pastures of the Central Plain are devoted mainly to dairying and the rearing of horses and pigs. Store cattle are often sent from the west of the plain eastward to be fattened on the richer pastures of Meath, and many are shipped to Liverpool and Birkenhead, and brought to prime condition on the English plain. The west of Ireland, and Donegal in particular, is a very thinly peopled region, for the soil is poor, the rainfall very heavy, and only with difficulty do the inhabitants wrest a living from the land and the sea that washes their coasts.

Dublin (470,000), the capital, on a fine harbour in the centre of the east coast, is the natural outlet for the Central Plain. Its exports include cattle, horses, and beer, and its industries the manufacture of tobacco, biscuits, and soap. Among its chief imports are wheat, coal, and iron and steel goods. Kingstown (Dun Laoghaire), on Dublin Bay, is a packet station for Holyhead. *Cork*, standing at the point where the Lee enters Cork harbour, manufactures agricultural machinery, is a brewing and distilling centre, and exports dairy produce. Queenstown (Cobh), on an island in the harbour, is a port of call for trans-Atlantic liners. In the south-east, Waterford and Wexford are small ports and market towns, and Rosslare the packet station for Fishguard. The centre of an agricultural region, *Limerick*, at the head of the Shannon estuary, cures bacon, makes lard and condensed milk, and imports coal and grain for use in Western Ireland. From Limerick a motor road runs to the Shannon

Airport at Foynes, on the left bank of the Shannon estuary, whence liners fly to Port Botwood, Newfoundland. With accommodation for both flying-boats and aeroplanes, the Shannon Airport should become the chief European airport for trans-Atlantic services.

Northern Ireland. Though Northern Ireland comprises only one-sixth of the country, it contains nearly 30 per cent. of the population. Agriculture is important, oats, potatoes, flax, and hay being among the principal crops. The damp climate is well suited for flax, while ample supplies of pure water are available for retting it, and for use in the various stages of the *linen*-manufacturing industry for which Northern Ireland is justly famed.

Belfast (438,000), the capital, stands where the Lagan enters Belfast Lough, whence sea-routes go to Glasgow, Barrow, Heysham, Fleetwood, and Liverpool. There is little coal or iron ore in Northern Ireland, but coal is imported from the Scottish and Cumberland coal-fields and steel from Furness. So, thanks to cheap water-transport, and the initiative of her people, Belfast has become one of the leading shipbuilding areas in the British Isles. Heavy (including agricultural) machinery, linen, matches, rope, and tobacco are manufactured in the city, which is also engaged in brewing, distilling, and flour-milling. To the north-east is Larne, a packet station for Stranraer (36 miles), in Scotland. *Londonderry*, on the Foyle, makes linen goods and shirts. To the west lies part of Eire, separated by tariff barriers from Northern Ireland: thus deprived of a portion of her natural hinterland, the trade of Londonderry has suffered since the partition of the country.

EXERCISES

1. Describe (*a*) the physical features, and (*b*) the climate of Ireland. Show how both combine to affect the human activities.

2. (*a*) Why do the relief and climate of the Central Plain of Ireland make it well suited for dairy farming? (*b*) Describe briefly the dairy and other farming activities of this area. (*c*) Name (i) four exports, and (ii) two imports dependent on farming. (*d*) Name the two chief ports in Eire exporting farm produce. (*e*) What recently completed large-scale engineering scheme is likely to assist the development of manufactures in Eire? Why? (*f*) What manufactures are best suited to the geographical conditions of Eire? Give your reasons. (*g*) Are such manufactures likely to be concentrated in a few areas, or scattered throughout the country? Why?

3. Among the industries of Belfast are shipbuilding, linen manufacturing, and the making of agricultural machinery. How do you account for the location of these industries in Belfast?

4. Select *one* thickly peopled, and *one* thinly peopled area in Ireland. Explain how, in each case, the density or sparsity is affected by the relief, climate, and resulting occupations.

5. (*a*) State in what respects Eire and Wales differ so markedly in (i) relief, (ii) power resources. (*b*) What are the differences in *pastoral* farming in these two countries, and to what geographical factors are the differences due?

CHAPTER XIII

COUNTRIES OF WESTERN EUROPE

(*excluding the British Isles*)

FRANCE

THE area of France is somewhat less than that of Germany, but her population is little more than half as great. Washed by the English

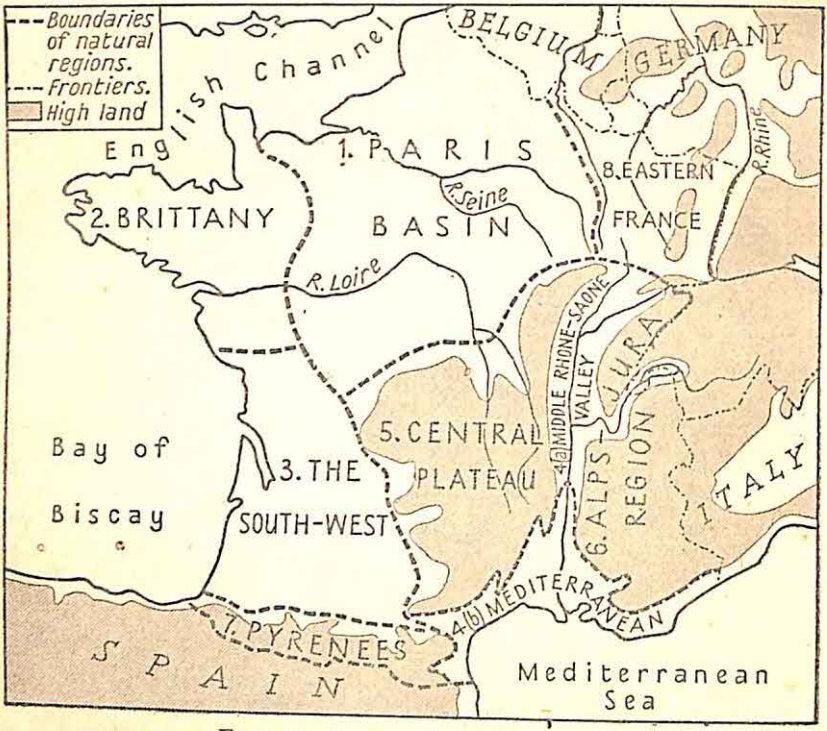


FIG. 121. France: Natural regions.

Channel on the north-west, by the Atlantic on the west, and the Mediterranean on the south-east, France is well placed for overseas trade. Her maritime situation also favourably affects her climate, which in the north-west is insular, in the south-east Mediterranean, and only in the east approaches continental conditions. Except where

the Franco-Belgian frontier crosses the Northern Plain, the land boundaries of France are well defined. The Pyrenees separate her from Spain, the Alps from Italy, and the Alps and the Jura from Switzerland. From the Rhine, which in part marks the frontier with Germany, the boundary runs through a belt of highlands to Luxembourg and thence across the Ardennes to the Plain of Southern Belgium.

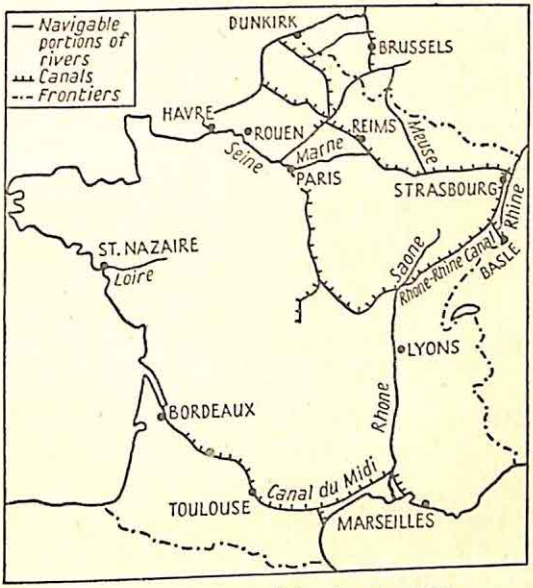


FIG. 122. France: Inland waterways.

The French river and canal system, which is linked with those of Belgium and Germany, is an important factor in the transport of the country (Fig. 122). Rivers, like the Seine and its tributaries, the Saône and the Rhine, all navigable for considerable distances, are linked by canals. They are much used for carrying heavy, bulky, and relatively non-perishable commodities, like coal, ore, grain, and building materials.

More than half of France consists of lowlands of great fertility. Forests cover over 20 per cent. of the country, and only 10 per cent. consists of unproductive moor and mountain land (see Fig. 123). Of the total area, 66 per cent. is cultivated, of which amount 60 per cent. is arable and the rest pastoral land. In France, out of every

100 people, 40 are engaged in agriculture, compared with 8 in the United Kingdom. There are few large estates. Most of the farms are small and the majority are worked by their owners. In recent years there has been a drift from the rural areas to the towns, but, in spite of this, agriculture is the mainstay of the Republic and the landowning peasantry are the backbone of the country.

France may be divided into a number of *Natural Regions* differing

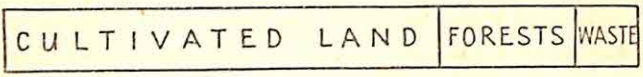


FIG. 123.

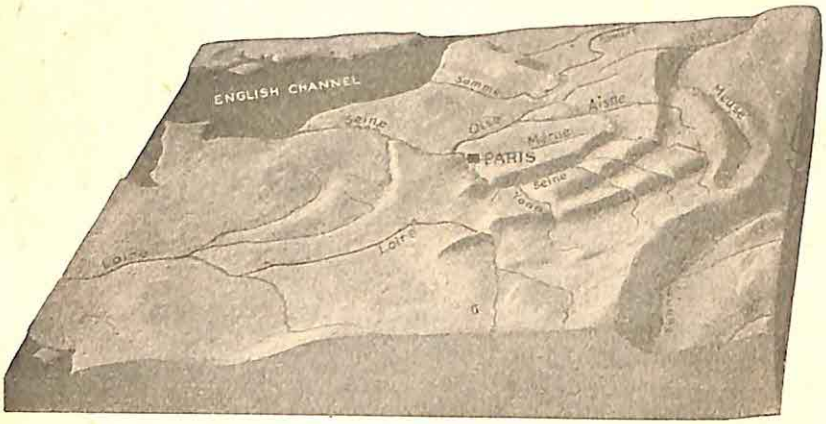


FIG. 124. Relief model of the Paris Basin.

somewhat in configuration, climate, and products, but linked with each other to form a united whole. The chief of these regions (Fig. 121) are (1) the Paris Basin, (2) Brittany, (3) the South-West, (4) (*a*) the Rhone-Saône Valley and (*b*) Mediterranean France, (5) the Central Plateau, (6) the Alps-Jura Region, (7) the Pyrenees, and (8) Eastern France.

(1) **The Paris Basin.** Paris lies in the centre of a basin which may be compared to a nest of saucers with the smallest in the centre, but it should be noted that in the north-west the concentric circles are broken by the English Channel (see Fig. 124). The land slopes gradually upwards from the centre, falling, on the side away from Paris, by steep chalk or limestone escarpments to narrow clay plains.

Rivers, such as the Seine and its tributaries the Oise and the Marne, have cut gaps through the encircling escarpments, in which stand towns, and through which run roads and railways.

The variety of soils in the basin is reflected in the vegetation, crops, and products. To the south-west of Paris lies the district of Beauce, a limestone upland partly covered with fertile loam, noted for its wheat and its sheep which help to enrich the ground. The wool of the sheep, with that of others pastured on the drier upland areas of the basin, and with much imported through Dunkirk, is manufactured at Amiens, on the Somme, and Rouen, the large river-port on the Seine which is the leading cotton-manufacturing town in France. The southward-facing escarpments of the Loire valley and the Champagne district, notably round Reims, are famed for their vineyards and their wine.

Both in its climate and products *Normandy* shows a marked resemblance to Devon and Somerset, and like these English counties is noted for cattle and cider-apples. Farther east, sugar-beet, hops, and flax are grown in French *Flanders*, flax providing raw material for the linen factories of St. Quentin and Cambrai.

In the north of the Paris Basin lies the French portion of the *Franco-Belgian coal-field*, where the closely linked towns of *Lille* (200,000), Roubaix, and Tourcoing manufacture cotton, linen, and woollen fabrics, importing raw materials through Dunkirk and *Havre*, the second port of France, situated at the mouth of the Seine. These two ports, like Dieppe, Boulogne, and Calais, are packet stations for cross-Channel steamers.

Mainly owing to her commanding position, *Paris* (2,900,000) grew from a fishing settlement, on an island in the Seine, to be the capital of France. It is the chief inland port in France. Routes by road, river and canal, rail, and air converge on Paris from all directions (see Figs. 122, 124, and 126). Like London and Berlin, the city is a great industrial centre. It is noted for its artistic products, is a leader of fashion, manufactures motor-cars, boots and shoes, refines sugar, and grinds flour. It makes paper; like most university towns it is a centre of the book and publishing trades; and it is also one of the world's leading wool markets.

(2) Brittany. The interior of Brittany consists mainly of uplands, whose old rocks have weathered to form rather infertile soils

covered in part with forests and heaths, and in part devoted to the cultivation of crops like rye and oats which can be grown in a damp climate and on poor soils. On the richer coastal lands cattle are bred and the crops include early fruits, vegetables, and flowers, produced for the Paris markets.

Many of the Bretons, like their neighbours across the Channel, are sailors and fishermen. Among the largest fishing ports are St. Malo and Lorient. Brest and Cherbourg are naval stations, and the latter is also a port of call for trans-Atlantic liners. *Nantes*, at the head of the Loire estuary, one of the two capitals of Brittany (the other being Rennes), has shipyards and chemical, cotton, and tin-plate factories. Its outport is St. Nazaire.

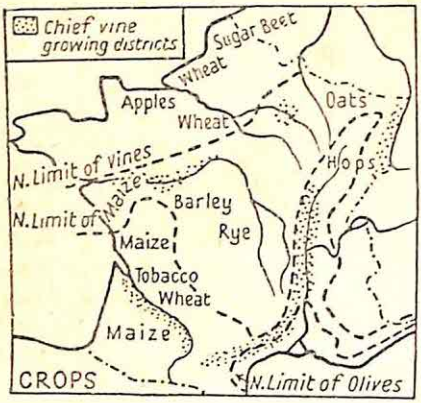


FIG. 125. France: Crops.

The Channel Islands (Jersey, Guernsey, Alderney, Sark), lying off the coast of Brittany, are the only remaining part of Britain's heritage from the Normans. Their mild climate favours the production of early fruit and vegetables, the bulk of which are marketed in England, and also makes them a favourite holiday resort.

(3) **South-West France**, or the Basin of Aquitaine, is watered by the Dordogne and the Garonne, which carry nearly all the drainage of the area to the Gironde estuary. There is sufficient rain and the summers are warm enough to allow maize to be grown. It is found mainly in the west, while farther inland much wheat is cultivated on the clay plain round Toulouse. The district round Bordeaux is noted for its vineyards, which produce excellent wine, while north of the Gironde estuary brandy is distilled from grapes grown in the basin of the Charente. South of the Gironde estuary the sandy district, called the Landes, once a waste covered with rough pasture, has been drained and planted with pines which yield timber, turpentine, resin, and tar. *Bordeaux* (260,000), standing on the edge of

firm ground at the head of the Gironde estuary, has large iron and steel industries, refines sugar, and bottles local fruit and vegetables. Through *Toulouse* (220,000), a market town and route centre, pass the road, railway, and canal which run, by way of the Gate of Carcassonne, to the lower Rhone valley and the Mediterranean.

(4) The Rhone-Saône Valley and Mediterranean France. From early times the Rhone-Saône Valley, running between the Alps and Jura on the east and the Central Plateau on the west, has formed a corridor leading from the Mediterranean to the Paris Basin (across the Côte-d'Or), as well as an important route linking the former region with the Rhine Valley.

Climatically we may divide the Rhone-Saône Valley into two portions. North of Valence (just below the confluence of the Rhone and Isère) the climate resembles that of Central Europe: the summers are hot, the winters cool, and there is rain at all seasons, but most in summer. South of Valence the climate is of the Mediterranean type with hot, dry summers and warm, moist winters. The vine is grown throughout the valley. On the slopes of the Côte d'Or are produced the famous wines of Burgundy, where Dijon, the chief centre of the trade, is a nodal point and important railway junction. The olive, which cannot stand cold winters, is confined to the lower portion of the valley where, too, are grown many mulberry trees whose leaves are used to feed silkworms, as well as early fruits and vegetables. In winter sheep are grazed on the plains of the Rhone delta, but in spring they are taken by train to the upland pastures of the French Alps, which remain fresh when those of the lowlands are withered—an interesting example of *transhumance*.

The valley lacks minerals, but some coal is found on the margin of the Central Plateau (St. Étienne), while the Alpine streams furnish hydro-electric power which is being increasingly used for manufacturing, municipal, and domestic purposes. *Lyons* (570,000), the third largest city in France, stands at the confluence of the Rhone and Saône. The leading silk-manufacturing town in the world, it uses, in addition to local supplies, Chinese and Japanese silk imported through Marseilles. Nearly all the overseas trade of the valley passes through *Marseilles* (915,000), the chief port of France, which stands to the east of the Rhone delta. Among its imports are palm oil and kernels used in its soap and margarine factories, coal, wheat, and wool.

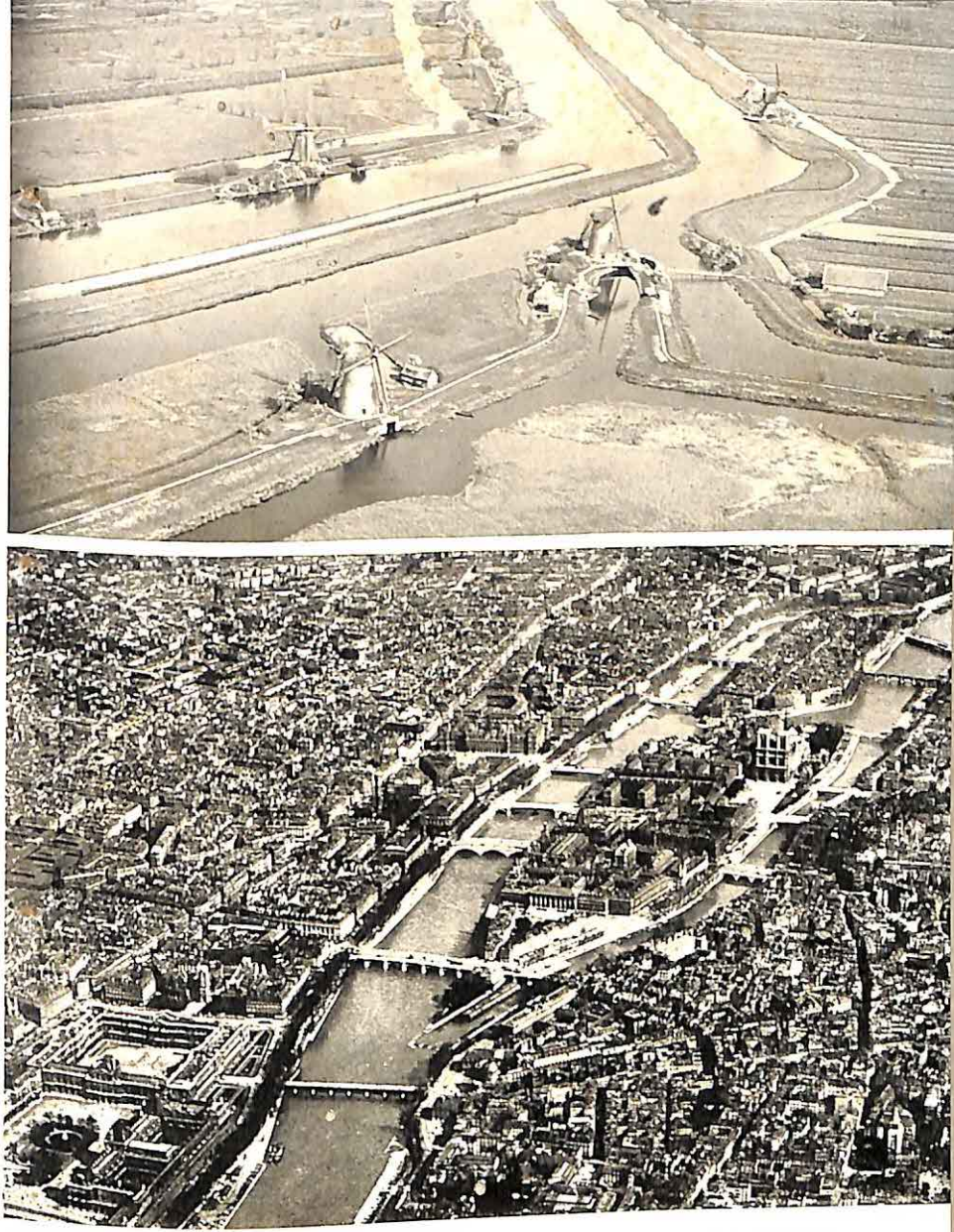
East of Marseilles the railway runs along the coast, by way of the naval base of Toulon, to the Riviera, whose equable climate and scenery attract many visitors to Cannes, *Nice* (240,000), Monte Carlo, and smaller centres. The high mountain barrier protects this coastal district from the cold northerly winds, while the southward-facing slopes get the full benefit of the sun's rays.

Corsica forms part of Mediterranean France. Geologically a crust-block, it is a mountainous island surrounded by narrow coastal plains. A considerable portion is forested and much is covered with scrub (called *maquis*) consisting of drought-resisting shrubs. Some agriculture is carried on, but fishing and cattle rearing are the chief occupations. The capital is Ajaccio.

(5) **The Central Plateau** rises towards the south-east, where its edge is formed by the Cevennes which sink steeply to the Rhone valley. The old rocks of this ancient crust-block weather to form poor soils, though in some districts, such as the upper Allier valley (the Limagne), there are fertile deposits of volcanic soil rich in lime and potash. In the Limagne valley, where stands *Clermont Ferrand*, the only really large town, fruits, vines, wheat, and sugar-beet are grown. But outside a few favoured areas rye, oats, and buckwheat are the chief crops. The little towns and villages are the centres of hard-working farming communities, as too are the scattered hamlets which are a notable feature of this region. The scenery attracts many visitors, while others 'take the cure' at spas, like Vichy, on the Allier.

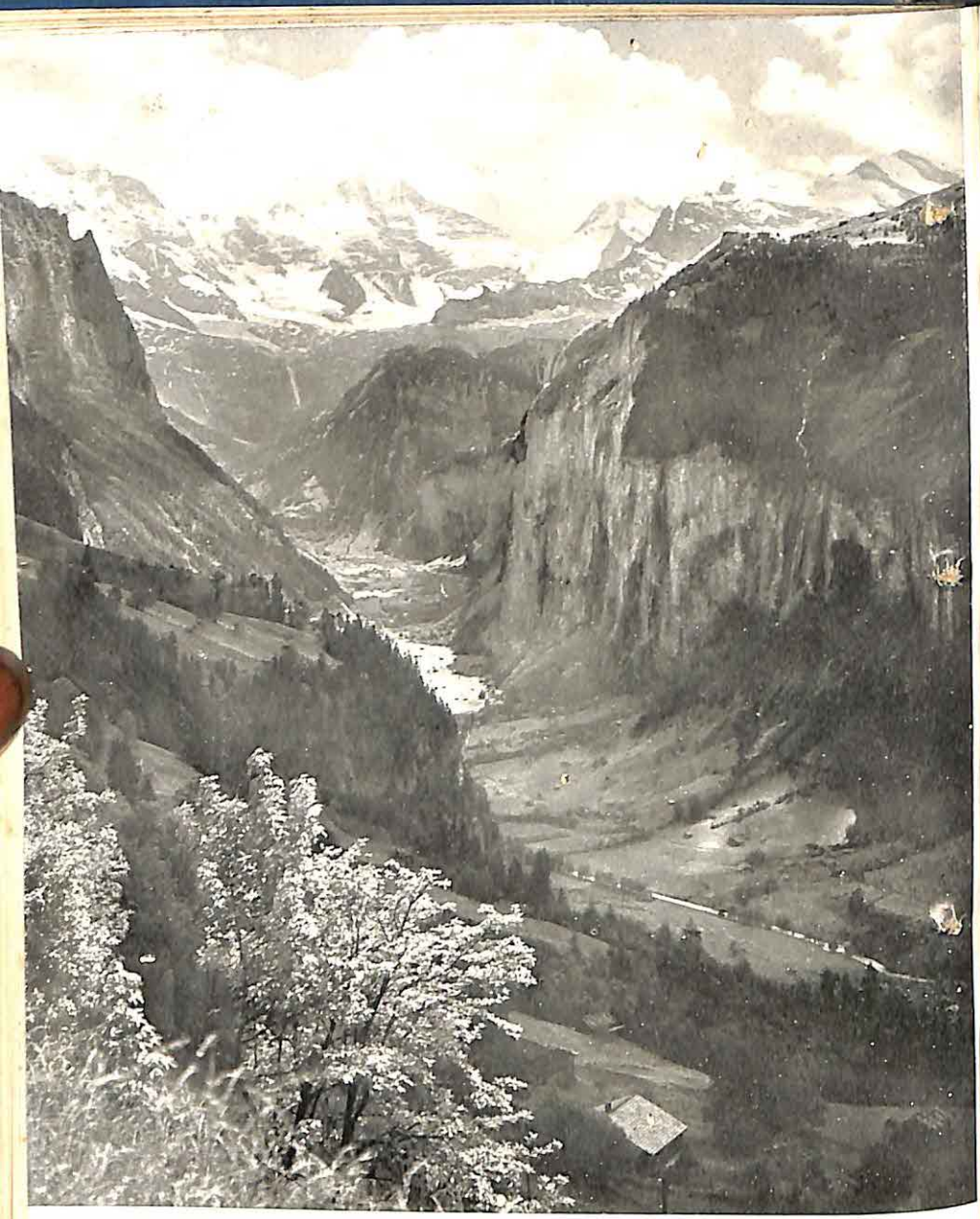
On the eastern edge of the Plateau are three small coal- and iron-fields. One lies round Le Creusot, an important machinery and munition centre; another round St. Étienne, which manufactures iron and steel goods and silk.

(6) **The Alps-Jura Region.** From the Alps and the Jura numbers of streams descend to the Rhone and Saône, whose valleys, as well as those of the Doubs, Isère, and Durance are, in part, followed by railways. In recent years many streams have been harnessed for electricity, which supplies power for aluminium factories in the Durance and Isère valleys, and also for railways. In late spring sheep are brought by rail from the lowlands to feed on the upland pastures: their skins, together with local and imported goat-skins, are made into gloves at Grenoble, on the Isère, which also manu-



13. RECLAIMED LAND—A GREAT EUROPEAN CAPITAL

(*Above*) A reclaimed agricultural area in Holland lying south-east of Rotterdam. The win
mills furnish power for pumping water from the channels, draining the low-lying polder
to the main canals that carry it to the sea. Dykes prevent the canals from flooding th
surrounding land which lies at a lower level than the water. (*Below*) From a fishing settl
ment on these islands in the Seine, Paris gradually grew until it is now a city with near
3 million inhabitants. On the Ile de la Cité, Notre Dame may be seen facing the squar
The famous Louvre lies on the left bank of the river (*right*) while the Louvre may b

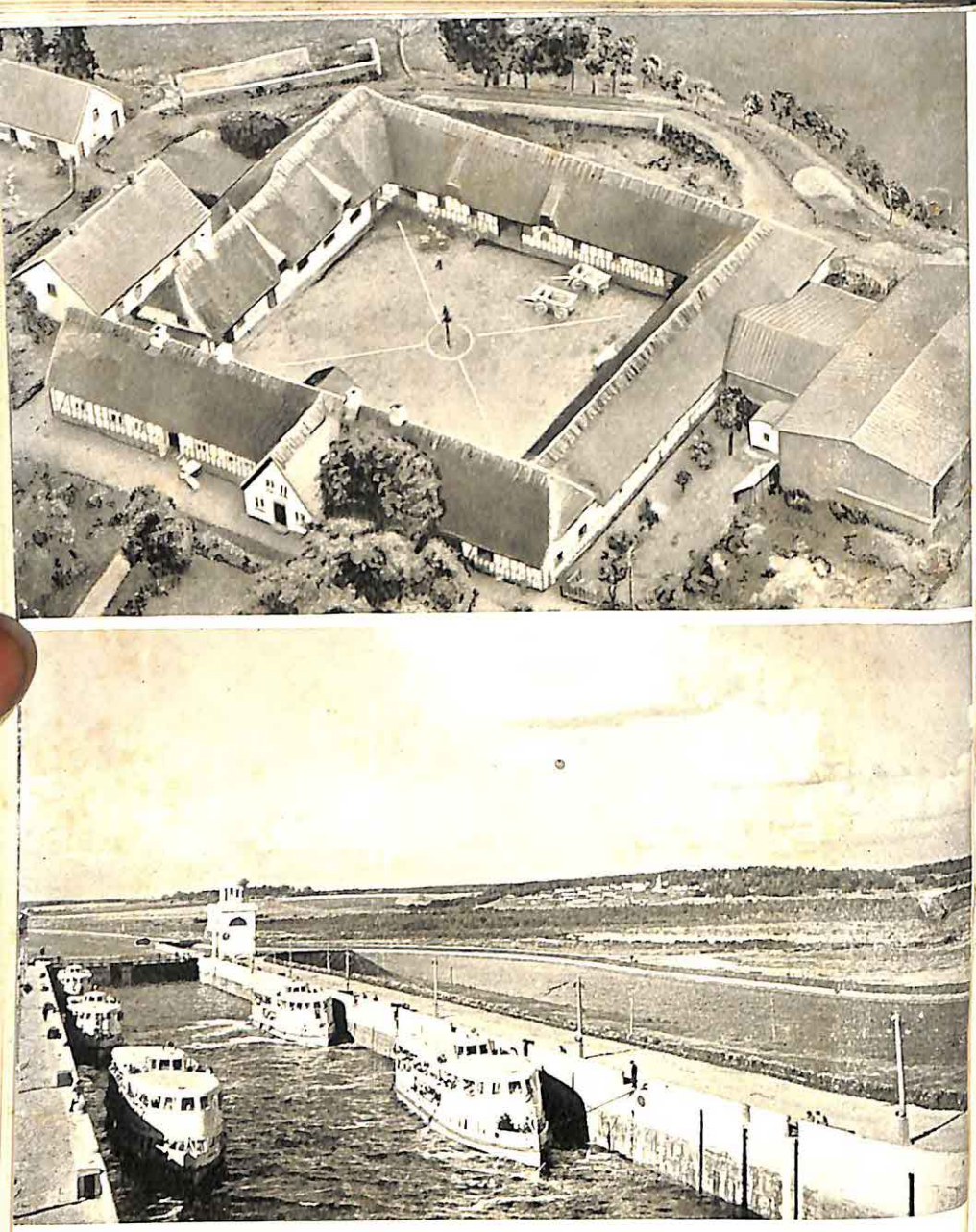


14. THE LAUTERBRUNNEN VALLEY, BERNESE OBERLAND

ıe flat floor of the main U-shaped valley rises by steep cliffs to the *hanging valleys* above, e of which may be seen on the left. These *hanging valleys* are covered with glacial debris ıich forms a rich soil, clad with pastures on which cattle feed. From these gently graded side-valleys streams descend by waterfalls which furnish power to generate electricity.

15. MAN AND NATURE IN SCANDINAVIA

(*Above*) Stockholm, the capital of Sweden, which is mainly built on two groups of island one at the entrance to Lake Malar and the other in an arm of the Baltic. The oldest part the city stands on the main island. Most of the fine public buildings are constructed granite (see p. 210). (*Below*) The Geiranger Fiord: one of the many fiords that pier Norway's 12,000 miles of precipitous, island-fringed coastline. With her rugged mountain rivers, lakes, and fiords, Norway has little land available for cultivation, and most of the arab ground lies in narrow strips along the rivers or at the heads of the fiords.



16. A DANISH DAIRY FARM—THE MOSCOW-VOLGA CANAL

Above) A Danish dairy farm. The farmsteads were originally built in this shape to provide protection against wild animals (see p. 204). (*Below*) The Moscow–Volga Canal, opened in July 1937. Moscow is now an inland port connected with the Baltic, White, and Caspian Seas.

factures paper. Chambèry, on the Mont Cenis route to Italy, manufactures silk; Besançon, on the Doubs, makes watches.

(7) **The Pyrenees** have an average elevation of from 6,500 to 10,000 feet. On the Spanish side they sink gradually by a series of plateaux to the Meseta: on the French side they fall steeply, being trenched by wooded valleys, down which the rivers (many harnessed for hydro-electric power) flow in series of gorges and basins. The Pyrenees contain some small glaciers. Passes across the mountains are high and relatively few. The main railway lines from France to Spain run from Bayonne round the western end, and from Perpignan round the eastern end of the mountains, but a line from Pau to Saragossa, and another from Toulouse to Barcelona, cross the chain. The latter runs to the west of the little mountain state of *Andorra*.

(8) **Eastern France** may be divided into *Alsace* and *Lorraine*.

The plateau of *Lorraine*, rising to the east of the Marne valley, and forming a link between the Vosges and the Ardennes, is crossed by the Meuse and the Moselle. In parts thickly forested, and a region of poor soils, its wealth lies in its iron mines, which produce 80 per cent. of the iron ores won in France. *Nancy* (120,000) is an important iron-smelting and cotton-manufacturing centre. Strategically the region is of great importance, as is seen by the fortress-towns of Metz on the Moselle, Verdun on the Meuse, and Toul, commanding the gap leading from the valley of the Meuse to that of the Moselle. Outside the few large towns, most of the inhabitants of this thinly peopled region, who depend mainly on agriculture and forestry for their livelihood, live in small scattered villages and hamlets.

Alsace, stretching from the forested slopes of the Vosges to the Rhine, reverted to France, with Lorraine, in 1919. Forming the western portion of the Rhine rift valley, its climate and crops resemble those on the German side of the river. Vineyards clothe the lower slopes of the Vosges; fields of wheat, barley, and tobacco, hop-gardens and orchards spread over the plain. The deposits of potash are even richer than those at Stassfurt in Germany. *Strasbourg* (180,000), on the Ill, near its confluence with the Rhine, the chief city and an important river port, commands routes through the Rhine valley, and also by the Lorraine Gate to Nancy. Colmar

manufactures cotton goods and artificial silk, while Mulhouse is also engaged in the cotton industry.

Transport and Trade. The rail, road, and canal system of France is best visualized by noting how the routes converge on

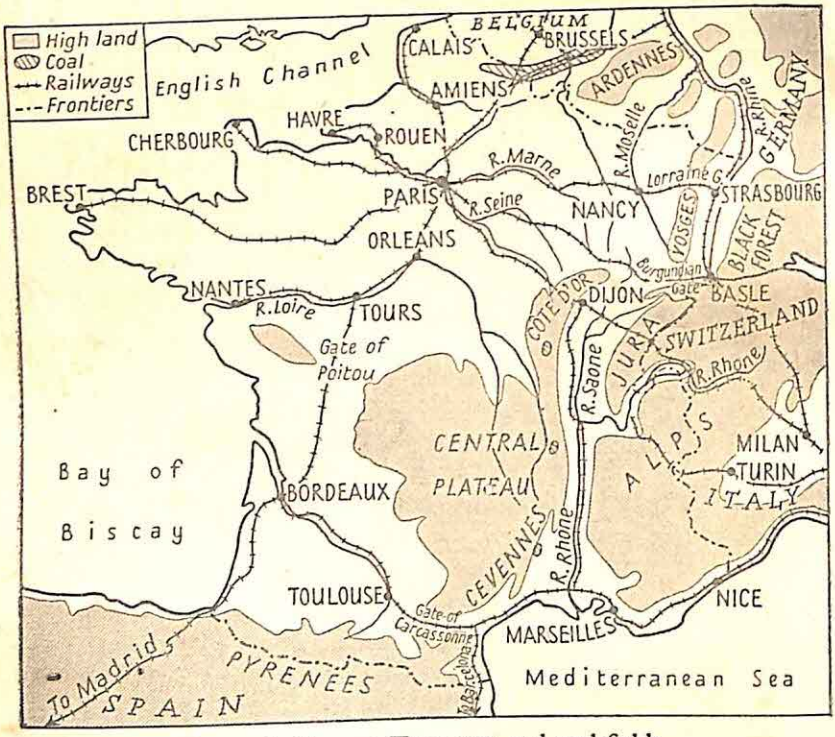


FIG. 126. France: Transport and coal-fields.

Paris. The main railways avoid the uplands, but communications between the three principal lowland areas are relatively easy. The Paris Basin is linked by the Gate of Poitou with the South-West, and across the Côte d'Or with the Rhone-Saône valley. The latter route is followed by the Paris–Lyons–Mediterranean Railway. Routes from the lower Rhone valley and the Mediterranean to the South-West run through the Gate of Carcassonne, between the Pyrenees and the Central Uplands.

About three-fifths of the French coal is obtained from the

northern field, but, compared with Germany and the United Kingdom, France is not rich in coal, which is her leading import. On the other hand, her plentiful supplies of iron ore have helped to make her one of the leading iron and steel manufacturing countries. In recent years hydro-electric power has been much developed, especially in the Alps, Jura, Vosges, and Pyrenees. These supplies have played their part in the growth of the electrical and electro-chemical industries. Marseilles, conveniently placed for importing the necessary heavy and bulky materials by sea, is an important

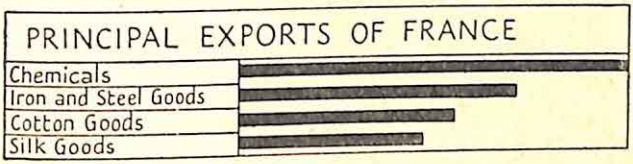


FIG. 127.

centre of chemical manufactures. France is noted for her silk goods which, like so many of her products, have an especially artistic finish. As a cotton manufacturing country, she ranks third: raw cotton comes next to coal in the import list. The woollen industry grew up in the sheep-rearing areas in the north, and with the development of the neighbouring coal-field increased in importance. To-day local supplies of wool are supplemented by those from the British Empire, which enter through Havre, Dunkirk, and Rouen. Some wool is also obtained from Algeria and other parts of the French Colonial Empire, much of this being imported through Marseilles.

EXERCISES

1. Describe the structure and relief of the Paris Basin, and show how they affect the human activities of the region. Give a sketch-map.

2. Draw a sketch-map of France and indicate upon it the principal natural regions. Select *one* of the more important regions (excluding the Paris Basin) and show how its relief, climate, and soils are related to its characteristic products. Name the chief port, or ports, through which the surplus products are exported.

3. Show how the relief of France has affected (*a*) railway communications, and (*b*) the canal system. Describe the route by which goods are conveyed by inland waterways from the Franco-Belgian coal-field to Paris.

4. (*a*) Name the chief centres in France for the manufacture of the following textile goods: cotton, woollen, silk and artificial silk, and linen. Tabulate

your answer. (*b*) In the case of *one* of the above manufactures, choose *one* important centre of production and account for the location of the industry in that area. Name also the port, or ports, through which this centre obtains its raw material, and state the main sources of supply.

5. How do you account for the fact that in France vines are not grown on an economic scale north of the Loire and Aisne valleys? Name the chief wine-producing areas in the country and the principal towns, connected with the industry, in each area.

6. Illustrating your answer by sketch-maps, describe the positions of Bordeaux, Marseilles, and Havre, pointing out the geographical importance of each port. Compare their trade.

BELGIUM AND HOLLAND

BELGIUM

Belgium is little more than one and a half times the size of Wales, yet this kingdom, with a population of over 8 millions, or 703 persons to the square mile, is one of the most densely peopled countries in Europe. Belgium is a buffer state lying between more powerful neighbours—France and Germany—and her position, athwart the European Plain, has too often made her a battle-ground of Europe.

Across the Northern Plain the Schelde flows in a north-easterly direction to Antwerp, below which it enters the North Sea by a delta. In the south the Meuse has cut a deep valley through the Ardennes, but after receiving at Namur the Sambre from the south-west, the united stream follows the direction of this tributary along the foot of the mountains to Liège, where it turns north and flows across Holland (as the Maas) to the sea. From early times the Sambre-Meuse valley has formed an important route leading, by way of the Oise valley, from the Paris Basin to the Rhine at Cologne.

Belgium may be divided into three Natural Regions: (1) the Northern Plain; (2) the High Plains; and (3) the Ardennes.

(1) **The Northern Plain,** extending westward into France and eastward into Holland, stretches from the High Plains to the low, sandy coast bordered by sand dunes and devoid of good natural harbours; for those of the packet stations of Ostend and Zeebrugge are artificial, and constant dredging is necessary to keep them free from silt. Of recent geological formation, the plain is composed mainly of sands and clays with the addition of peaty soils in the coastal region. Cattle are reared, and on the intensely cultivated

land wheat, sugar-beet, hops, tobacco, and flax are grown, especially in the west on the clay soils of Flanders. In the east rich loam soils are devoted mainly to fruit cultivation and market-gardening.

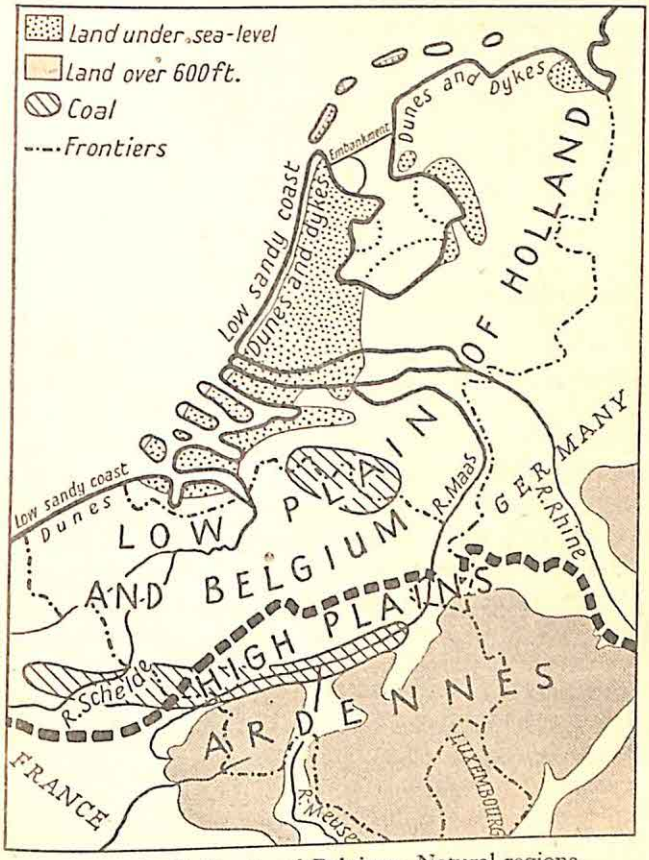


FIG. 128. Holland and Belgium: Natural regions.

The waters of the Schelde, the Lys, and other streams are used for retting flax, which is made into linen at Tournai, on the Schelde; Courtrai, on the Lys; and Ghent, at the confluence of these two streams. *Ghent*, also noted for its cotton goods, was, like quaint old Bruges, a great woollen-manufacturing centre in the Middle Ages. In the north-east of the plain the sandy Campine district, which extends across the frontier into the Dutch province of Limburg,

consists mainly of moorland and marsh. It may one day become an important industrial region, for beneath the overlying sand lies coal, which is, however, buried at a considerable depth and is thus expensive to work.

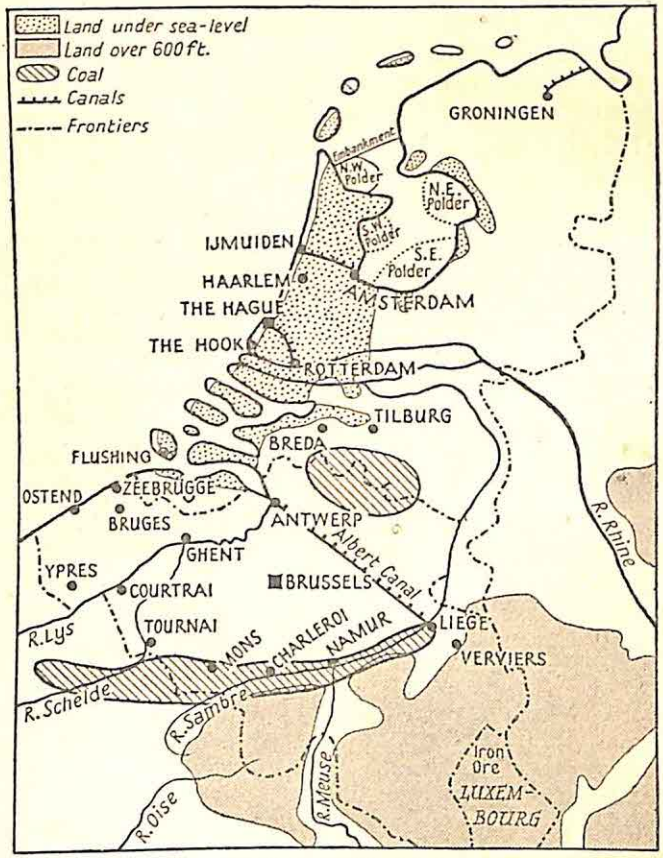


FIG. 129. Holland and Belgium: Coal-fields and principal canals.

Antwerp (273,000), the premier port of Belgium, lies at the head of the Schelde estuary, the mouth of which is in Dutch territory. From Antwerp heavy and bulky goods are dispatched by canal to all parts of Belgium; and the city is noted for its sugar-refineries, distilleries, and diamond-cutting works. *Brussels* (900,000), stands on the Senne (a tributary of the Schelde), midway between Antwerp and

the industrial district to the south. It is the focus of Belgium's rail and canal system, and owing to its central position is well placed to be the capital.

(2) **The High Plains**, lying between the Northern Plain and the Ardennes, are floored with Tertiary rocks. On their varied soils, oats, wheat and barley are all cultivated, while dairy cattle are grazed on their pasture lands. But the chief wealth of this region lies in its rich seams of coal. The *Belgian Coal-field*, extending along the Sambre-Meuse valley, forms part of the coal basin stretching from Anzin, in Northern France, to Aachen, in Germany. From Mons

FIG. 130.

to Liège a line of mining and manufacturing towns is strung along the valley. *Mons* is noted for its breweries, distilleries, sugar-refineries, and glass works; *Charleroi* for its plate-glass and hardware. The latter industry, like that of Liège, owes its origin to the zinc mines at Verviers, whose output is, however, decreasing. At *Liège* (162,000) there are also important iron foundries and railway works. Formerly considerable quantities of iron ore were mined on the Belgian coal-field, but now most of the ore smelted in the blast-furnaces of Liège is imported from Luxembourg. The deep-water Albert Canal, opened in 1939, links Liège with Antwerp.

(3) **The Ardennes** present a great contrast to the rest of Belgium. They are the most thinly peopled region for, apart from the fact that they are the only upland area in the country, their ancient (Primary) rocks have weathered to form rugged scenery and infertile soils. Moreover, their climate tends to be extreme. Much of this highland region is clad with moorland and forests of beech, oak, and pine. The peasants work hard tilling their fields of rye, oats, and potatoes; grazing sheep on the moorlands, feeding pigs on the acorns and beech-mast in the forests, and tending dairy cattle reared on the more fertile western slopes of the uplands.

Most of the inhabitants of Southern Belgium are Walloons, akin to the French and speaking a dialect very like that of their neighbours across the frontier. They differ greatly both in appearance and speech from the Flemings living in the north, who more closely resemble the Dutch and the Germans. These differences in race and outlook have played no small part in shaping the present foreign policy of Belgium, which aims at keeping free from alliances with her more powerful neighbours, and so far as possible at preserving her independence by her own efforts.

Luxembourg is a small Grand Duchy lying in the south-east of the forested Ardennes. Agriculture is important, but the chief wealth of this state lies in its rich deposits of iron ore. Since 1921 Luxembourg and Belgium have been united in an economic union, with a common currency and no customs barriers between them.

HOLLAND OR THE NETHERLANDS

Holland is somewhat larger than Belgium, and, owing to its rapid growth of population, is even more thickly inhabited, being, with 707 persons to the square mile, Europe's most densely peopled country.

Nearly half of Holland has an elevation of only 3 feet above mean sea-level, while in the west an area, comprising a quarter of the country, is actually below sea-level. 'Only in the low plateau of South Limburg, bordering the Ardennes, is the land over 300 feet, and even here the highest portion scarcely exceeds 1,000 feet. Holland has been built up of sediment brought down by the Rhine, Maas (Meuse), and Schelde. As many of the rivers now flow at a higher level than the surrounding land they are enclosed by embankments, called dykes. Along the wind-swept North Sea coast and its island-fringe stretch sand dunes varying in elevation from 30 to 150 feet. In places where the dunes are low, dykes of earth and stones, or ferro-concrete, have been built to protect the low-lying land behind from the inroads of the sea.

Behind these dunes stretches the *polder* country, where thousands of acres of former marsh land have been reclaimed by building dykes and cutting canals to carry away the surplus water. A scheme for reclaiming the Zuider Zee is now in progress. The first part of the work—the reclamation of the north-west polder—was completed in 1930 (Fig. 131).

In Holland, owing to the dense population, land is extremely

valuable and intensely cultivated. Some of the polders are sown with rye, oats, wheat, and barley; others planted with potatoes, sugar-beet, mustard, and flax. But the greater part of the polder land consists of pasture on which some 3,000,000 cattle are grazed. Dairying is one of the leading industries. The production of butter, cheese, and condensed milk is important, as also is the manufacture of margarine, in the preparation of which milk is mixed with vegetable oils, obtained mainly from the Dutch East Indies. *Groningen* is one of the principal butter-collecting centres; Alkmaar and Edam are famous for their cheeses. In the district south of *The Hague* (480,000), which is the seat of the government, fruit, vegetables, and flowers are raised under glass; round *Haarlem*, to the north, are the famous bulb-fields.

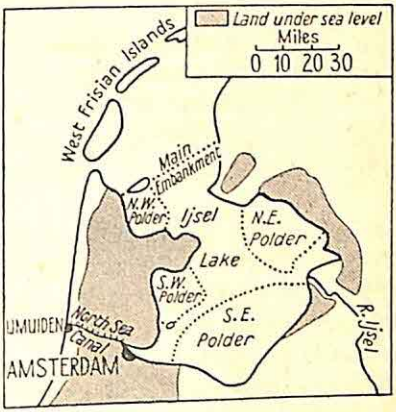


FIG. 131. Reclamation in the Zuider Zee.

On the *South Limburg Coal-field* mining has greatly developed in recent years, and in this area are also industries associated with the manufacture of chemicals, cement, glass, and paper. In the west, woollen goods are made at *Tilburg*, and artificial silk at Breda; while the Overijsel district, in the north, is a cotton- and linen-manufacturing area.

Amsterdam (780,000), on the shallow Zuider Zee, is, like many cities in Holland, built on reclaimed land. The construction of a ship-canal linking the great port with Ijmuiden, on the North Sea, has greatly benefited its trade. Among its imports from the Dutch East Indies are rubber, vegetable oils, cocoa, spices, tobacco, and tin: part of this produce is manufactured in Amsterdam, part is re-exported. The city also has large sugar-refineries, and shares with Antwerp the premier position in the diamond-cutting industry. *Rotterdam* (600,000), the other great port, on the Maas (Meuse), one of the mouths of the Rhine, is also connected with the North Sea by a ship-canal. It has big shipyards. Its position at the mouth of the

Rhine has given it a great transit trade. Seventy-five per cent. of the goods landed at Rotterdam are re-exported mainly by the Rhine valley (both by water and rail) to Germany, Eastern France, and Switzerland. Its outport is the Hook of Holland which, like Flushing, on an island at the mouth of the Schelde, is a packet station. A number of smaller ports are centres for deep-sea and coastal fisheries.

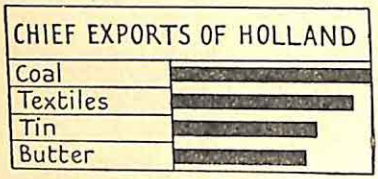


FIG. 132.

The maritime position of Holland, which like her neighbour Belgium is a buffer state, lying athwart one of the great arteries of Europe, has given her people exceptional opportunities both for overseas and overland trade. The rather inhospitable nature of the country and its relatively small area have played no small part in encouraging Dutch expansion overseas where, in the course of several centuries, the people of Holland have built up a great colonial Empire. Despite the fact that they have lost many of their former possessions, the colonies owned by the Dutch in the East Indies and Guiana have an area of over 790,000 square miles, and a population of more than 60 millions.

EXERCISES

1. How do you account for the fact that Belgium and Holland are two of the most densely peopled countries in Europe?
2. Divide Belgium into natural regions. Describe *one* of these regions with reference to (*a*) its climate, (*b*) its soils, and (*c*) its human activities.
3. Describe the position of (*a*) Antwerp and (*b*) Amsterdam, illustrating your answers by sketch maps. Which of these two ports do you consider is the more advantageously placed? Compare their trade.
4. Describe the methods by which the Dutch have reclaimed a large proportion of their country from the sea. In what area have extensive reclamation schemes recently been successfully completed?

SWITZERLAND: A BUFFER STATE

PLACED in the heart of Europe, Switzerland has no seaboard, but her position at the crossing-place of transcontinental routes gives her access to three of the chief European countries as well as to the Danube Lands. A buffer state, she has preserved her independence. Yet her people have no common racial origin, neither have they one common language. Those in the west and south-west are French-

speaking; those in the north and centre talk German; around the heads of Lake Maggiore and Lake Lugano, Italian is the usual tongue; while in the Upper Rhine valley Romansch, a dialect derived from Latin, is used. The majority of the educated people are, however, bilingual, while many speak three languages.

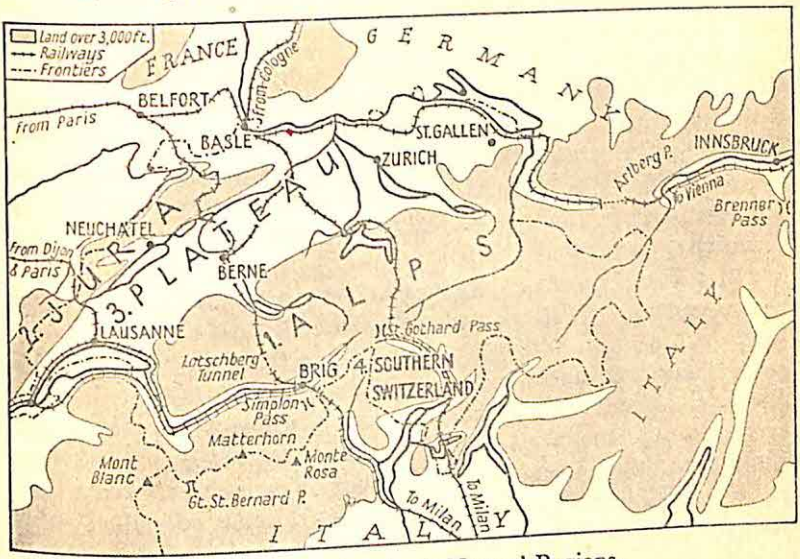


FIG. 133. Switzerland: Natural Regions.

Four Natural Regions may be distinguished: (1) the Alps, (2) the Jura, (3) the Plateau, lying between these two areas, and (4) Southern Switzerland (Ticino).

(1) The Alps. About a quarter of the Alps, which extend in a semi-circle from the Gulf of Genoa to the middle Danube Plain, lies in Switzerland. The Alpine fold-ranges are separated by longitudinal valleys traversed by numerous rivers. Some of the longest streams in Europe rise in the Alps. Among them are the Rhine flowing into the North Sea, the Rhone falling into the Mediterranean, and the Po running eastward to the Adriatic. Though the headwaters of the Danube are in the Black Forest Range, the Inn and other of its tributaries have their sources in the Alps. Roads and railways from Central Europe to the Mediterranean wind up the Alpine valleys to the passes. The roads cross the passes: many of the railways tunnel

underneath or near the most important ones. The chief of these passes are the *Mont Cenis*,[1] which leads from France to Italy; the *Great* and *Little St. Bernard*, west of the Pennine Alps, little used at the present time; the *Simplon*;[1] the *St. Gotthard*;[1] and the *Brenner Pass*, on the German-Italian frontier, crossed by the railway from Innsbruck (Germany) to Verona (Italy). The *Arlberg Pass* (Germany) forms a channel of communication between the valleys of the Rhine and the Inn.

The Alps, rising to nearly 16,000 feet, contain most of the highest peaks in Europe. Mont Blanc (15,800 feet) towers above the Franco-Swiss boundary; somewhat to the east the Matterhorn (14,700 feet) and Mont Rosa (15,217 feet) rise high above the ridges of the Pennine Alps, whose snow-clad crests here form the frontier between Switzerland and Italy.

Among these peaks and ranges lie great snowfields from which glaciers, such as the Aletsch glacier in the Bernese Oberland, move slowly—from 50 to 350 feet a year—down the valleys. In the Ice Age, glaciers, far larger than any in Switzerland to-day, filled the Alpine valleys and carried down morainic material which they spread over the lower lands. As such glaciers travelled down the river valleys they *over-deepened* them, forming trough-like U-shaped depressions. Such glaciated valleys have flat floors bordered on either side by steep cliffs, above which rise the more gradual slopes of the original V-shaped river valley. From these gently graded side valleys, known as *hanging valleys*, streams often descend by waterfalls to the main U-shaped valley below. Such streams furnish power to generate electricity used in Alpine villages, by funicular railways, and in factories. The hanging valleys are covered with glacial debris which forms a fertile soil, clad with rich pastures, called *alps*. In winter these alps are covered with snow, but in spring and summer many cattle are driven up from the lower lands to graze on their well-watered slopes. Thus dairying, associated with the making of cheese, condensed milk, and milk chocolate, is important in the Alpine region. The hotel industry brings much wealth to Switzerland. Both in summer and winter tourists visit the Alps, while seekers after health stay at high resorts, such as Davos (5,121 feet) and Arosa (6,000 feet), to benefit by the pure, dust-free, and invigorating air and the powerful sunshine.

[1] Railway tunnels have been constructed under or near these passes.

(2) **The Jura**, which extend from the valley of the middle Rhone to the Rhine, do not attain a height of more than 5,000 feet. As in the Alps, the fold-ranges are separated by longitudinal valleys between which, however, communication is established by transverse river gaps (called *cluses*), like those followed by the railways from Dijon (*a*) via Neuchâtel to Berne, and (*b*) to Lausanne. The broad valley floors are clad with meadows, the steeper slopes with pine-woods above which rise upland pastures. Cattle-rearing is important. Watch-making is carried on in many of the villages.

(3) **The Plateau** lies between the Alps and the Jura, which converge towards the lower end of Lake Geneva. From this lake the wedge-shaped upland stretches north-eastward, growing broader as it approaches Lake Constance and the Rhine. With an elevation of from 1,200 to 2,400 feet, it is an undulating region with many rounded hills of morainic material, but with few extensive stretches of level land. The greater part of the Plateau lies in the basin of the Aar, which, after descending from the Bernese Oberland, carries the drainage of Lakes Neuchâtel, Lucerne, and Zürich to the Rhine.

Of the 4 million inhabitants of Switzerland the majority live on the Plateau. Agriculture is confined mainly to growing crops, like wheat, rye, and potatoes, required for home consumption. It is interesting to note that though one-quarter of Switzerland is forested, so great is the demand for wood, both for house-building and fuel, that timber has to be imported. Owing to its central position *Berne* (112,000), the capital, is a great railway junction, as too is *Basle* (148,000). The latter town is a focus of routes coming up the Rhine valley from Cologne; westward from Vienna via the Arlberg tunnel; and east from Paris by way of the Burgundian Gate. From Basle the railway through Lucerne makes for the St. Gotthard tunnel, whence it descends by the Ticino valley, and crossing Lake Lugano passes through Como (Italy) to Milan. The line from Paris and Dijon, after passing through Lausanne, continues up the Rhone valley to Brig, passes through the Simplon tunnel, and descends by way of the Toce valley and Lake Maggiore to Milan. After leaving Berne another railway ascends the Aar valley to Lake Thun and reaches the Simplon line by way of the Lotschberg tunnel.

All the largest towns in Switzerland are situated on the Plateau and nearly all are engaged in some form of manufacture. Switzerland

lacks coal and other minerals, but is exceptionally rich in hydro-electric power, which is largely used in factories, and by about one-third of the railways, which are gradually being further electrified. Owing to her situation most of the raw materials required for Swiss manufactures have to be imported, often from a considerable distance, and, in the case of those obtained from overseas, through foreign ports. Thus the Swiss, like the people of South-West Germany, concentrate on the manufacture of goods requiring relatively little raw material, but much skilled labour, for their production. *Geneva* (124,000), at the south end of Lake Geneva, was the seat of

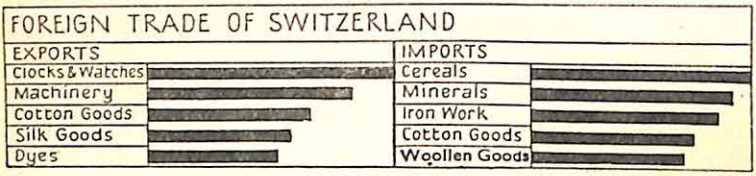


FIG. 134.

the former *League of Nations*. It makes watches, clocks, scientific instruments, and jewellery, while similar goods are also manufactured at Neuchâtel and Berne. Raw silk, imported mainly from Italy via the St. Gotthard route, is manufactured at *Zürich* (312,000), the largest town in Switzerland, Basle, and other smaller centres on this commercial highway. *Basle* is an exception to the general rule regarding Swiss manufactures, for, owing to its situation on the Rhine, it can import cheaply by water the bulky and heavy raw materials required for its chemical and dye-stuff industries. *St. Gallen*, some distance to the south of Lake Constance, manufactures lace, embroidery, and fine cotton goods.

(4) **Southern Switzerland** (consisting of the canton of Ticino), stretching from the southern slopes of the Alps to the heads of Lake Maggiore and Lake Lugano, differs greatly from the rest of the country. Owing to their latitude, their sunny skies, and the fact that they are sheltered by the Alps from the cold north winds, the southward-facing valleys have an exceptionally genial climate, and their products (which include vines and warm temperate fruits) resemble those of the adjacent lake district of Northern Italy. Both Lugano and Locarno are popular lake-side watering-places.

EXERCISES

1. How do you account for the fact that Switzerland specializes in the manufacture of goods requiring comparatively little raw material, but needing skilled labour, and of considerable value in proportion to their bulk? Name four such manufactured goods, stating in each case (i) the chief centres of production, and (ii) one country supplying the necessary raw materials.

2. Draw a sketch-map of the Alps showing the principal passes. Insert the chief railway lines and in each case mark and name one important town on either side of the Alps.

3. (*a*) Draw a contour map representing a typical U-shaped valley in the Alps. On your map mark, by the letter P, the probable site of a power station. (*b*) Contrast the life led by the inhabitants in summer with that during winter.

CHAPTER XIV

THE BALTIC LANDS AND THEIR MARGINS

DENMARK

DENMARK is about twice the size of Wales. It comprises the greater part of the Jutland Peninsula and a number of islands at the entrance to the Baltic. Except for the rocky land of Bornholm, in the Baltic, the country is flat, or undulating, and forms part of the Great European Plain. The west coast of Jutland has few good harbours. It is fringed by sand-dunes backed by barren heaths. In recent times, however, much land in this district has been reclaimed by planting pine-woods and hedges to prevent the sand from blowing farther inland, and by draining and fertilizing the soil. The east coast is indented with numerous openings. The Lijm Fiord, which bears, however, no resemblance to a true fiord, extends across the Peninsula from the North Sea to the Kattegat.

Little more than half a century ago mixed farming was the rule in Denmark. But the Danish farmers found they were losing their markets owing to the competition of cereals and other produce from the New World. So they turned their attention to dairying and the rearing of pigs and poultry, thus producing butter, bacon, and eggs, the bulk of which found a market amidst the rapidly growing population of industrial England. Marshes and moorlands were reclaimed, impoverished soils improved by fertilization, clover, roots, oats, and other fodder crops were sown, and herds were improved by the introduction of pedigree stock. At the same time the farmers, though retaining the ownership of their small farms, adopted co-operative methods. They joined together to establish dairies, to purchase fodder, fertilizers, tools, machinery, pedigree stock, and to transport and market their produce. By-products were utilized, e.g. skim milk was used to feed pigs, and regular inspection and the grading of produce ensured that high standards were maintained. Thus did the Danes acquire a reputation for their dairy produce, the bulk of which finds a market in England and Germany.

Denmark has valuable fisheries. She sends ships to the North Sea, but many cod, plaice, and mackerel are caught in the Kattegat. Young plaice from the North Sea are reared on a vast scale in the

Lijm Fiord. Esbjerg, the chief fish market, carries on a considerable trade with England.

One-fourth of Denmark's $3\frac{3}{4}$ million inhabitants live in the capital, *Copenhagen*, and its suburbs. Standing on the Sound, at the entrance to the Baltic, it has a commanding situation. It is a great entrepôt port, from which produce is dispatched to all parts of Central and Northern Europe by way of train ferries which provide direct communication with Stockholm via Malmo, Lübeck, and Hamburg. Its industries include distilling, brewing, sugar-refining, and the making of porcelain. Next in size to the capital are *Aarhus*, on the east coast of Jutland, and Odense, in Fyen.

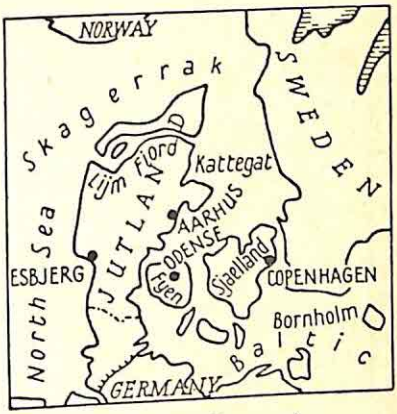


FIG. 135. Denmark.

Denmark is closely allied by ties of race, language, and culture to Norway and Sweden, and from time to time the three countries have formed, in whole or part, one kingdom. In the days of the Vikings Norway was the chief state; in the Middle Ages Denmark, best placed for trade, took the lead; but in the seventeenth century Sweden—owing mainly, however, to historical rather than geographical causes—was predominant.

The *Faroe Islands* (540 square miles), placed midway between Norway, Scotland, and Iceland, are part of Denmark. *Greenland* is the only colonial possession.

Iceland (40,000 square miles). Formerly united to Denmark by common allegiance to the same king, Iceland became a republic in 1944. Much of the island is unproductive, but it is interesting on account of its glaciers, active volcanoes (Hekla), and fiords. Fishing and sheep farming are the chief occupations.

EXERCISES

1. Give a reasoned account of the dairy industry of Denmark.
2. Illustrating your answer by a sketch map, describe the situation of Copenhagen and discuss the geographical causes that have contributed to its importance.

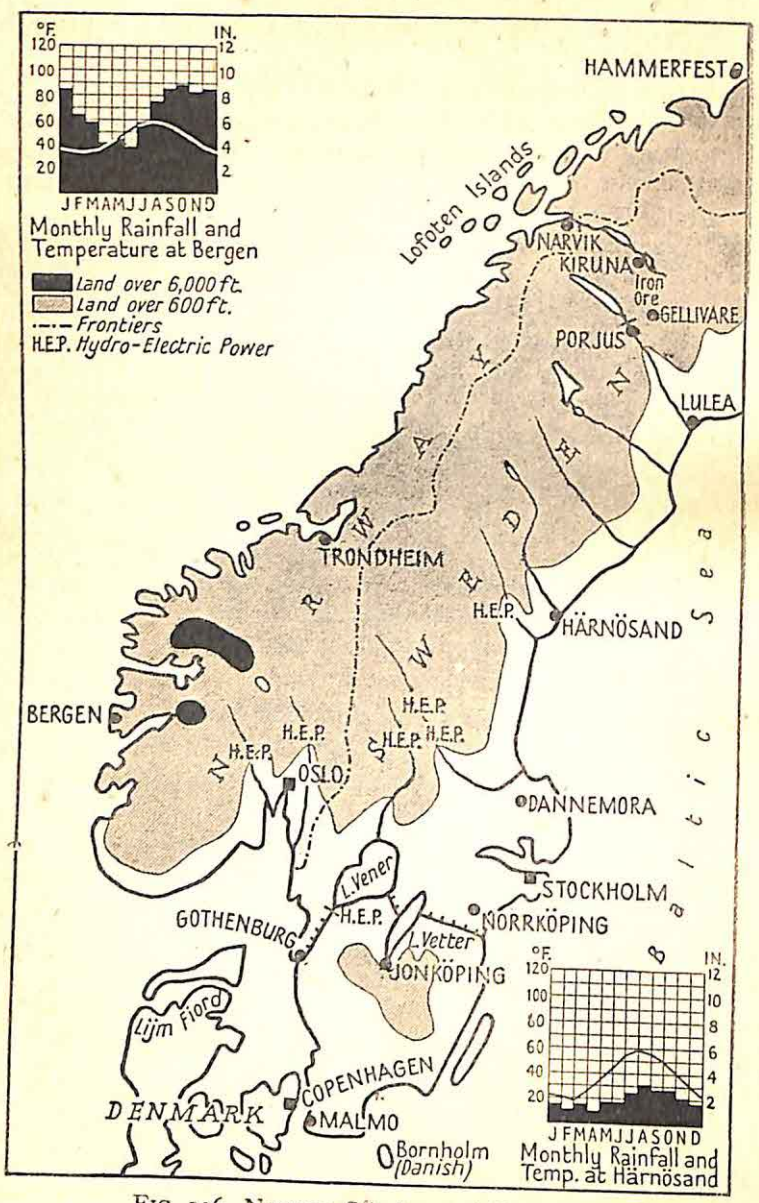


FIG. 136. Norway, Sweden, and Denmark.

SCANDINAVIA—NORWAY AND SWEDEN

Scandinavia is divided politically into Norway and Sweden. The greater part of the peninsula consists of a lofty plateau composed of ancient and much-denuded rocks that extend into Finland. Only in Southern Sweden is there a considerable lowland area, which here forms a detached portion of the Great European Plain. Greatest of all agents which have worn away the surface was ice, which during the Ice Age covered the whole peninsula. The highlands rise steeply from the west coast, but slope gradually in wide terraces to the Baltic. They are highest and widest in the south-west, where they reach their greatest elevations in the Jotun Fjeld and the Hardanger Fjeld—wild rock-strewn wastes amid whose peaks lie snow-fields and glaciers. From the main watershed, which lies close to the west coast, short, swift streams descend to the Atlantic, while longer ones flow south-east to the Baltic. Many of the latter expand into lakes and form numerous falls which, like the Trollhättan Falls on the Gota river, are harnessed for electric power.

The precipitous west coast is fringed with countless islands and indented with steep-sided fiords, some of which, like the Sogne fiord, extend into the plateau for more than 100 miles. The Swedish coast is lower and much less broken than that of Norway.

Climate. The prevailing south-west winds drive the warm water of the North Atlantic Drift along the west coast, causing the climate to be very mild. On the other hand, the east coast lands, facing the shallow and almost land-locked Baltic, have a more extreme climate. The summers are warmer, but the winters are much colder and in the north-east the harbours are ice-bound, as the Gulf of Bothnia is blocked with ice for seven months in the year. The south-west winds impinging on the steep mountain wall cause a heavy rainfall along the western side of the peninsula; but the east, lying in the rain-shadow of the mountains, is relatively dry. Compare the annual rainfall at Bergen, 81 inches, with that at Härnösand, on the east coast, 23 inches; and at Skjäk, in the sheltered interior, which has only 10 inches.

NORWAY

Though the area of Norway is approximately equal to that of the British Isles, yet her population is slightly less than that of the little state of Eire. The greater part of the country is mountainous, nearly three-quarters being unproductive. About one-fifth is covered with coniferous forests, and lumbering is an important industry, especially in the districts round Oslo. Out of every 100 acres less than 4 are suitable for cultivation and pasturage. Farms are small and few exceed 3 acres in extent. Most of them are placed at the heads of the fiords, on narrow strips of land at the base of the mountains, or in the lowland districts around Oslo fiord. Hay, potatoes, barley, and oats are the chief crops, but in most areas there is insufficient warmth and sunshine to ripen wheat. In spring cattle are driven to the upland pastures, where they remain until autumn, returning in winter to the lowlands, where they are housed in barns.

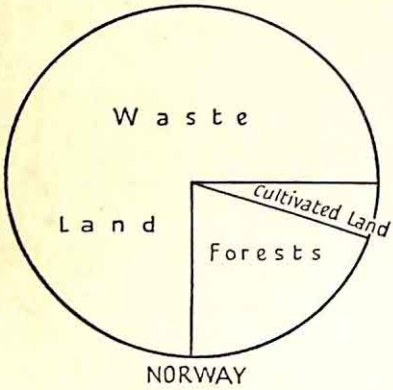


FIG. 137. Comparative utilization of land in Norway.

With a barren interior and a richly indented coast the Norwegians have become a nation of seafarers. Their mercantile marine actually ranks third after that of Britain and the United States. Fishing is one of the leading industries. From *Bergen* and *Trondheim* powerful steel ships go out to seek herring and cod; while some visit the Antarctic whaling grounds, for of all countries Norway ranks first in the whaling industry. Hammerfest, within the Arctic Circle, is a leading cod-fishing centre.

Norway's relative lack of minerals is compensated by her vast supplies of water-power, which is transformed into electricity. Much hydro-electric power is used by her electro-chemical industries, which include extracting nitrogen from the air for use in the manufacture of fertilizers and other products.

Railways, recently electrified, connect *Oslo* (253,000), the capital, with Bergen and Trondheim and with Swedish lines, but owing to the

mountainous nature of the country communications are carried on principally by water and road.

Norway's sovereignty over *Svalbard* (Spitzbergen), which has rich supplies of coal, was recognized in 1920.

SWEDEN

Sweden, unlike Norway, contains a considerable proportion of lowland. Southern Sweden is one great agricultural region where villages lie amidst fields of sugar-beet, wheat, oats, and potatoes, interspersed with woods of oak, beech, and other broad-leafed trees. Nearly half the kingdom is clad with forests of pine and spruce. Lumbering is important, especially in Central and Northern Sweden. In spring the rivers are alive with timber floating down to the saw-, pulp-, and paper-mills which are usually placed at or near their mouths to facilitate export. Norrköping is one of the leading centres of the paper industry; Jönköping, at the southern end of Lake Vätter, is famous for matches.

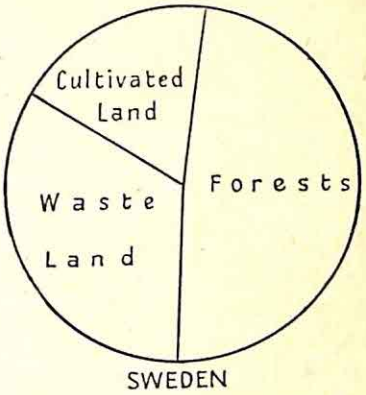


FIG. 138. Comparative utilization of land in Sweden.

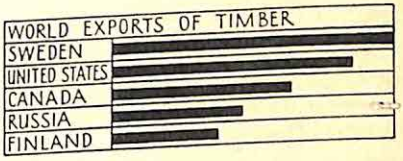


FIG. 139.

Sweden is rich in *iron ore* of a remarkably high quality. The Dannemora mines lie 60 miles north of Stockholm. From the Gellivare and Kiruna mines, farther north, much ore is exported from the Norwegian port of Narvik, which, unlike Lulea, the Swedish terminus of the line serving this district, is ice-free throughout the year.

Like her neighbour, Sweden lacks coal. She owes her industrial progress to the development of her hydro-electric power, which is used in her saw-, pulp-, and paper-mills; iron, steel, and electrical works, and, of course, for general purposes.

Stockholm (634,000), the capital, at the entrance to Lake Malar, has shipbuilding, engineering, pottery, and chemical industries. It is connected by rail with all parts of Sweden, and daily air-services link it with (*a*) *Malmö* and Amsterdam, and (*b*) Helsinki. Many of the exports of Sweden are dispatched through *Gothenburg* (Goteborg), at the mouth of the Gota river. The Gota Canal, now mainly used for tourist traffic, links this port, by way of Lakes Väner and Vätter, with the Baltic.

EXERCISE

1. Compare Norway with Sweden under the following headings: (*a*) relief, (*b*) climate, (*c*) products, (*d*) human activities.

FINLAND

Finland stretches from the Gulf of Finland to the Arctic Ocean. Though comparable in size to the British Isles its population is scarcely 4,000,000. More than one-third of the country consists of rivers, swamps, and lakes which range in size from Lake Saima to tiny lakelets. Three-quarters of the land-surface is forested. The north is a tundra region scantily peopled by Lapp tribes with herds of reindeer.

Structurally Finland is a low plateau. It forms part of the Baltic Shield, an ancient crust-block, which on the east extends to the depression running from the head of the Gulf of Finland through Lakes Ladoga and Onega to the White Sea, and on the east sinks beneath the Gulf of Bothnia to reappear in eastern Sweden. The bedrock, everywhere near the surface, is scarred by the marks of former glaciers, which (i) rounded the hills, (ii) scooped out rock basins now filled by innumerable lakes connected by short, swift streams on which rapids are frequent, and (iii) deposited masses of debris often in the form of low ridges, which provide sites for villages and are utilized by roads and railways in order to avoid the swampy ground. The Salpausselka, a terminal moraine running from Hanko to Lake Ladoga, backs the coastal plain which fronts the Gulf of Finland. In their passage across this ridge the rivers draining the lakes of southern Finland to the Gulf have cut rapids, whose waters are frequently harnessed for hydro-power. Such power is of great importance in a country that lacks coal. Indeed, Finland has few useful minerals

with the exception of iron and nickel, the latter mined at *Salmijarvi* in the extreme north.

Though a considerable proportion of Finland lies within the Arctic Circle, its climate is milder than that of most countries in similar latitudes, partly on account of the low elevation, partly because of the presence of large bodies of water which moderate the temperature of surrounding areas. But though the summer is warm even in the north, the long winter everywhere means snow and temperatures well below freezing-point.

FIG. 140. The Eastern Baltic Republics.

As forests cover so large an area lumbering is important. Timber is floated down the waterways, transport having been facilitated by cutting canals to avoid the rapids. Wood is widely used for fuel and for building houses. Sawn timber, wood-pulp, and paper comprise about 80 per cent. of the country's exports, the bulk being shipped through *Kotka*, on the Gulf of Finland, which is, however, ice-bound in winter.

Ice-breakers are used to keep open the harbour of *Helsinki*

(Helsingfors), the capital, on the Gulf of Finland, which manufactures textiles and metal goods; and that of *Turku* (Abo), which exports cattle, dairy produce, and timber, and manufactures paper, cotton goods, and margarine. Railways run from Helsinki and Turku to *Tampere*, the largest inland town, which uses local hydro-electric power in its saw- and paper-mills, and cotton factories. Northward the line passes through Oulu and Tornio at the head of the Gulf of Bothnia, to Rovaniemi. Thence the Arctic Highway runs north to *Petsamo*, an ice-free port on the Arctic, which was, however, ceded to Russia in 1940.

It is generally accepted that the Finns are of Mongolian origin. For more than five centuries they were ruled by the Swedes many of whom settled in the coastal belt. During this period a new Swedo-Finnish people arose, who derived much of their language and culture from Sweden. In 1809, Sweden ceded Finland to Russia, who governed the country until 1917 when, after the Russian Revolution, it became a Republic.

EXERCISE

1. Write an account of Finland under: (*a*) physical features, (*b*) climate, (*c*) natural vegetation and products, (*d*) chief towns and communications.

RUSSIA

(THE UNION OF SOVIET SOCIALIST REPUBLICS)

European Russia alone is equal in area to the rest of Europe. This Russian lowland stretches from the White Sea southward to the Caspian, the Caucasus, and the Black Sea, while from the eastern frontiers of the Baltic republics it extends to the Urals. The plain, which is floored with horizontal sedimentary strata and covered in the north with morainic deposits, is relatively level, rising in low swellings rather than ridges. Chief of these uplands is the belt running from the Sea of Azov northward to the Valdai Hills, where it reaches a height of somewhat over 1,000 feet. From this upland area another, but rather broken, belt runs north-eastward to the Urals.

Many of the rivers have cut their way deep below the general level of the plain; and those which, like the Volga, flow south usually have a high right bank and a low left bank. The Volga, the longest river in Europe, rises in the Valdai Hills and flows into the Caspian Sea through a huge delta. Among its chief tributaries are the Oka which

enters it at Gorky, and the Kama which joins it south of Kazan. Near Stalingrad, the Don approaches within 40 miles of the Volga. The Don, whose chief tributary is the Donetz, flows into the Sea of Azov. The Dnieper, the Dniester, and the Danube, which forms part of the Russian-Rumanian frontier, enter the Black Sea. The principal rivers entering the Baltic Sea are the Dvina flowing into the Gulf of Riga, and the Neva carrying the drainage of lakes Ladoga and Onega to the Gulf of Finland. These two lakes—the largest in Europe—are linked by the river Svir, now canalized to form part of the Baltic–White Sea Canal (opened in 1933), whose construction has shortened the distance between the Baltic and White Seas by 2,160 miles. A branch of this canal, running from the southern end of Lake Onega to the Sheksna, a tributary of the Volga, provides through communication with the latter river and thus with the Caspian Sea. The building of canals linking the larger rivers has greatly increased the usefulness of Russia's inland waterways. The completion of the Don–Volga Canal has made it possible for vessels to travel not only between the Baltic and White Seas and the Caspian, but also by river and canal to the Sea of Azov and the Black Sea. Unfortunately all these waterways are frozen in winter for periods ranging from three months in the south to six in the north.

Most of Russia has a continental climate with extremes of heat and cold. In winter, with the exception of the Crimean Peninsula, which has the mildest climate in the republic, the whole country has a temperature below freezing-point. The farther one travels north-east, away from the Atlantic, the colder it becomes. Compare the January temperatures at Kiev (21° F.), Moscow (12° F.), and Kazan (7° F.). In summer, broadly speaking, temperatures decrease from south to north, but the eastern part of the country is somewhat warmer than the west. Over most of Russia the mean annual rainfall is about 20 inches, but it is less in the north, owing to the low temperatures, and in the south-east (round the north and east of the Caspian Sea) as the prevailing winds blow over the land.

Natural Regions. As the climate and configuration are similar over vast areas, so, too, is the natural vegetation, which depends mainly on climatic conditions. It should, however, be clearly grasped that in many districts the natural vegetation has been modified by man, and that the different zones merge gradually into each other. In no

other country does the natural vegetation correspond more closely to the Natural Regions.

(1) **The Tundra** consists of a relatively narrow belt stretching along the coast-lands bordering the Arctic. The climatic conditions are too severe for trees, and vegetation is mainly confined to mosses and lichens on which feed the reindeer kept by nomadic Lapps and Samoyedes. The port of Murmansk, connected by rail with Leningrad, is usually ice-free in winter owing to the influence of the warm North Atlantic Drift (compare Petsamo, Finland).

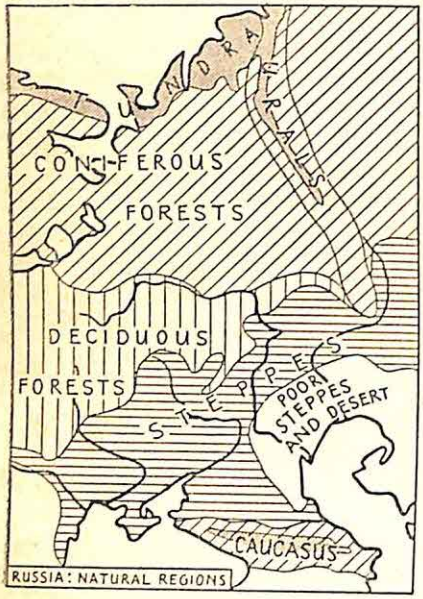


FIG. 141. European Russia: Natural Regions.

(2) **The Coniferous Forests** stretch from the tundra southward to a line running from the head of the Gulf of Finland to the confluence of the Volga and the Kama. Of the 40 per cent. of European Russia which is forested, the greater part is covered with pine and larch, and other coniferous trees. Lumbering is being developed, notably in the west, and in the middle basin of the Pechora, down which timber is floated to the Arctic Ocean in the summer months. On the cleared lands rye, oats, potatoes, and hemp are grown. *Arkhangelsk*, standing where the Dvina enters the White Sea, is ice-bound for six months. Its trade may benefit somewhat through the opening of the Baltic–White Sea Canal linking it with *Leningrad* (2,800,000). The latter city has engineering, chemical, and electrical works, and textile factories, but, like *Viborg* (Viipuri) to the north-west, it is handicapped by being blocked with ice in winter.

(3) **The Deciduous Forest Belt.** On the south the cold forests merge into the deciduous forests which stretch across European Russia to the Baltic. The southern margin of this region is marked

by a line running from Kazan, on the Volga, south-west through Kiev and thence to the Carpathian foothills. In the transitional zone between the coniferous and deciduous forests, conifers mingle with oaks and other broad-leafed trees. Besides including the heart of European Russia, this region embraces the Baltic Lands of Estonia, Latvia, and Lithuania, and part of the former German province of

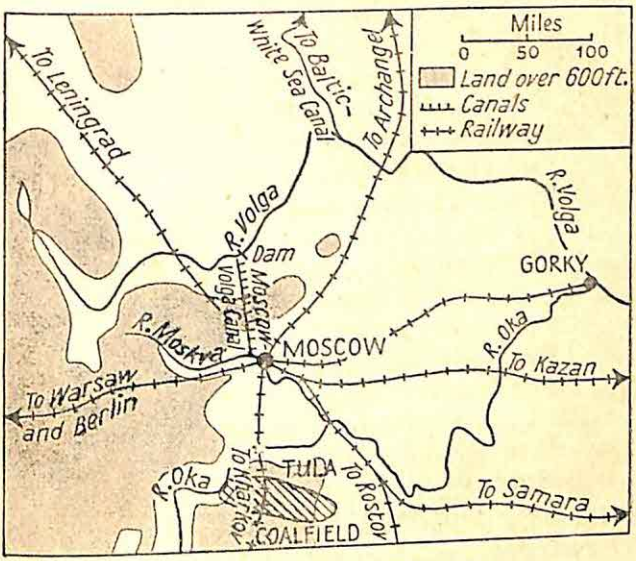


FIG. 142. The site of Moscow.

East Prussia; as well as a belt of territory ceded by Poland to Russia in 1945.

Generally speaking, the Deciduous Forest Region is more densely settled than the Cold Forests, though in certain areas, notably the Pripet Marshes—the greatest stretch of marshland in Europe—the density of population is extremely low. The forests provide a valuable store of timber as well as raw material for the manufacture of paper and artificial silk. Much land has, however, been cleared for cultivation. The climate restricts agriculture to quickly maturing crops, such as rye (the chief bread-crop), oats, barley, potatoes, sugar-beet, flax, and hemp. Many cattle and pigs are reared and much land is devoted to dairying, especially in Estonia, Latvia, and Lithuania.

Moscow (3½ millions), the capital of the U.S.S.R., placed on high ground above the Moskva, in the centre of the plain, is a focus of routes by rail, water, and air. The Moscow–Volga Canal, opened in July 1937, by diverting part of the waters of the Volga into the Moskva (Fig. 142), has made the latter a navigable waterway and also increased the supply of water available for Moscow's requirements. The city is now an inland port connected with the Baltic, White, Black, and Caspian Seas. Moscow's engineering shops and textile factories are supplied with coal from the *Tula Coal-field* to the south. Important cities standing where railways cross the Volga are *Gorky* (Nijni Novgorod) which manufactures motor-cars; *Kazan*; *Kuibishev* (Samara), a flour-milling centre; and *Saratov*, which refines oil shipped up the Volga.

The area transferred by Poland to Russia includes the oil-fields of Eastern Galicia, which stretch along the Carpathian foothills. To the north-east is *Lemburg* (Lwow), an important flour-milling centre. Farther north, flax and potatoes are widely grown around *Wilno* (280,000), which is noted for its distilleries. The chief Baltic ports are *Reval* (Tallinn), the capital of the Soviet Republic of Estonia, standing near the mouth of the Gulf of Finland; *Riga* (385,000), the capital of Latvia, situated some miles up the Dvina, which is an important timber-exporting port; *Memel*, at the entrance to the Kurisches Haff, the principal outlet for Lithuania; and the former German port of *Konigsberg*, which exports timber, grain, and flax.

(4) **The Steppes**, which extend from the deciduous forest belt, through the *Ukraine*, to the Black Sea, resemble the prairies of North America. The Black Earth Lands, their most fertile portion, lie mainly in the Ukraine, whose tractor-ploughed collective farms in normal times produce 20 per cent. of Russia's wheat and vast quantities of barley, oats, and sugar-beet. Of Russia's 170 million inhabitants some 40 millions live in the Ukraine, the chief industrial as well as the leading agricultural area in the U.S.S.R. The *Donetz Basin*, with adjacent iron-fields, accounts for 60 per cent. of the coal, 60 per cent. of the iron ore, 50 per cent. of the steel, and 70 per cent. of the aluminium manufactured in the U.S.S.R. It also produces more electricity than any other region in the Soviet Union. *Kiev*, the capital of the Ukraine, rose up at the junction of the forests and the steppes. Other important cities in the Ukraine, or on its margins, are *Dnepropetrovsk*; *Kharkov*, which makes tractors and machine

tools; *Mariupol*, on the Sea of Azov; and *Stalingrad*, on the Don, both iron and steel centres; and *Odessa*, which like *Kherson*, on the Dnieper, and *Rostov-on-Don*, is a grain port.

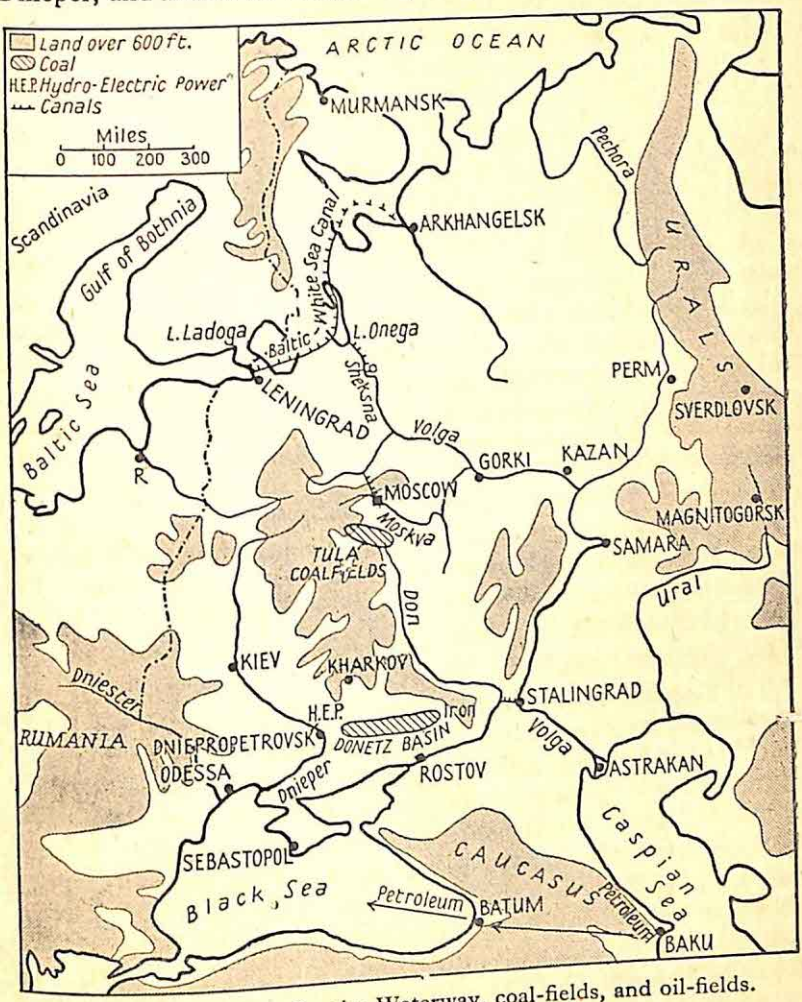


FIG. 143. European Russia: Waterway, coal-fields, and oil-fields.

(5) **The Steppe-Desert** region, a depression north and east of the Caspian, provides rough grazing. From *Astrakhan*, the centre of the sturgeon fisheries of the Caspian, oil is shipped up the Volga

into the heart of Russia; while from *Chapaev* it is piped from the neighbouring Emba field to the Urals.

(6) **The Caucasus Region.** The Caucasus fold-ranges (Elburz, 18,470 ft.), richly timbered on their lower slopes, contain deposits of iron, coal, copper, lead, zinc, and steel-hardening metals, such as nickel and manganese. The U.S.S.R. produces 10 per cent. of the world's *oil*, no less than 75 per cent. of Russia's supply coming from the *Baku* wells, whence the bulk is piped to *Batum*, on the Black Sea. From the *Grozny* gushers oil is piped to the refining centre of *Armavir*, and thence (1) to Tuapse, on the Black Sea, and (2) through Rostov-on-Don to the Donetz Basin.

(7) **The Urals** are rich in coal, iron, copper, nickel, chrome, and oil, all of which, since 1920, have been worked on an increasing scale in accordance with the policy of developing fresh industrial centres in the Urals and eastward. So great is the demand for coal that Ural supplies are supplemented by others from the Karaganda and Kuznetzk coal basins. *Magnitogorsk*, and its still more recent rival *Nizhni Tagil*, are among the leading iron and steel centres in the U.S.S.R. The latter town also manufactures chemicals, and, like *Sverdlovsk*, machine tools. *Perm*, beside being a mining centre, makes leather goods. *Chelyabinsk* is noted for tractors. Nickel and chrome are worked at *Orsk*, which also refines oil piped from the Emba field. But the chief refining centre is *Ufa*, on the Bashkirian oil-field, which stretches along the western slopes of the southern Urals.

The Expansion of Russia. The absence of physical barriers in European Russia has played a great part in moulding Russian history. But the vast extent of the country has hindered development.

In the ninth century the chief centres of European Russia were Novgorod, on the way from the Baltic to the Volga, and Kiev, in the Ukraine. Both these towns lie on the easiest route from the Black Sea to the Baltic, which runs east of the Carpathians and the Pinsk marshes. In the twelfth century Mongol invaders from Central Asia spread from Kazan over the steppes, but in the fifteenth century Ivan the Great defeated the Mongols and made Moscow, in the centre of the plain, the capital of Moscovy. Though transport was difficult in summer, in winter it was relatively easy over the hard frozen ground, and thus Ivan extended his kingdom northward to the White Sea. In the sixteenth century the Mongols were driven

out of European Russia, whose boundaries were extended south to the Black and Caspian Seas, and east to Siberia. The founding of St. Petersburg (Leningrad) by Peter the Great in 1702 marked the beginning of Russian expansion along the eastern shores of the Baltic. The extension to the Pacific in the nineteenth century was completed by building the Trans-Siberian Railway.

After the Revolution in 1917, when Russia became a Union of Soviet Socialist Republics (U.S.S.R.), Finland, Estonia, Latvia, and Lithuania became independent republics. In 1940 these territories, except Finland, were reincorporated in Russia. After the Second World War, Russia extended her frontiers westward to include (i) a belt of territory in Eastern Poland, (ii) part of East Prussia, and (iii) Ruthenia, inhabited mainly by Russian-speaking peoples, ceded to her by Czechoslovakia.

EXERCISES

1. Draw a sketch map of European Russia showing the chief natural regions. Give a description of *one* of the more important regions under the headings: Relief, Drainage, Climate, Crops, and Towns.
2. Draw sketch maps of Moscow, Leningrad, and Odessa to show how their growth has been influenced by their geographical position.
3. Describe the position and industries of (*a*) the Ukraine Industrial Area, and (*b*) the Southern Urals Industrial Area. In both cases give sketch maps.
4. Describe a steamer journey from the Caspian Sea to Moscow and thence to the Baltic Sea. Name probable cargoes carried from the Caspian to Moscow, and from Moscow to the Baltic.

POLAND

Stretching from the Carpathians to the Baltic, Poland lies athwart the Great European Plain midway between Germany and Russia. The absence of natural boundaries in the west and east has led to a considerable intermingling in these frontier zones. Hence no distinct racial or linguistic lines can be drawn between the Poles and either the Germans on the west, or the Russians on the east.

In the latter part of the eighteenth century Poland was partitioned between Russia, Prussia, and Austria, but after the First World War (1914–18) she became an independent Republic. But Polish freedom was short-lived. The outbreak of the Second World War saw Poland invaded by both Germany and Russia who divided the country between them. This Fourth Partition lasted until June 1941, when Germany attacked Russia and overran Russian-occupied Poland. By March 1945 the Russians had driven the Germans out

of Poland. The former eastern frontier of Poland was not, however, acceptable to Russia, who laid claim to a broad belt of territory in eastern Poland on the grounds that the majority of its inhabitants consisted of Russians and other non-Polish-speaking peoples. In return for ceding this eastern zone to Russia, Poland received as

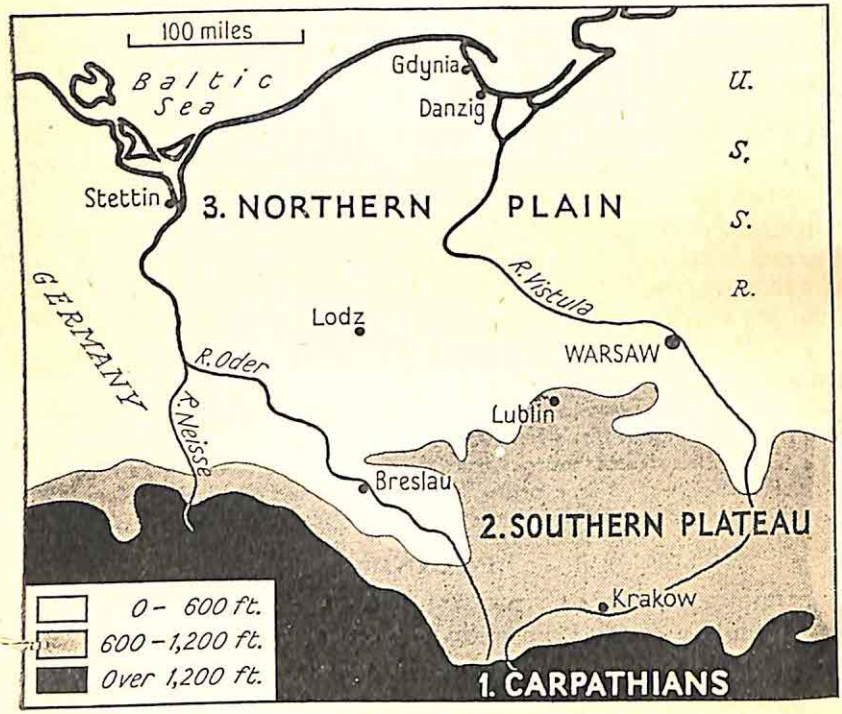


FIG. 144. Poland: Natural regions.

compensation (i) part of East Prussia, (ii) the port of Danzig, and (iii) an extension of territory in the west, which carried her frontier to the line of the Oder and its tributary the Neisse.

Poland has a continental *climate* which becomes more extreme towards the east. The summers are hot, but the winters are so severe that rivers and lakes are frozen for somewhat more than three months. At one time the greater part of the country was forest-clad, and even to-day over one-fifth is covered with forests of deciduous

and coniferous trees, the latter predominating especially in sandy areas.

We may divide Poland into three Natural Regions: (1) the Carpathians, (2) the Southern Plateau, and (3) the Northern Plains.

(1) **The Carpathians.** Only a small portion of the Carpathians lies in Poland. These forested mountains, though forming a continuation of the Alps, are much lower than the latter ranges, and even in the High Tatra do not exceed 9,000 feet. They form a well-marked frontier separating the Poles from their neighbours in North-West Rumania and in Slovakia.

(2) **The Southern Plateau,** though covering a much smaller area than the Northern Plain, is a more important region both on account of its rich and varied soils and its mineral wealth. The crops include wheat, sugar-beet, and flax. *Lublin*, on the north-eastern edge of the Plateau, is an important flour-milling centre. Many horses, too, are reared in this part of Poland, a country that has more horses per acre than any other except Denmark. This high proportion points to an absence of mechanical traction for farming purposes, and motor-cars and lorries for road transport.

Southern Poland is rich in minerals. Somewhat to the south of *Krakow* are valuable salt-mines, and in the south-east of the plateau are rich deposits of potassium salts. In Upper Silesia, high-grade coal, lying relatively near the surface, is mined round Krolewska Huta (Konigshutte), and *Katowice*, whence coal is shipped by canal to the navigable Oder, and by rail to Gdynia and Danzig for export. Local supplies of lead, zinc, and iron have given rise to metal industries mostly of the heavy type. *Czestochowa*, on the northern margin of the coal-field, manufactures cotton goods; *Breslau*, a bridge-town on the Oder, is noted for woollens.

(3) **The Northern Plains,** comprising the greater part of the country, are watered by the Vistula, the Warta, and other right-bank tributaries of the Oder. These lowlands, which form part of the Great European Plain, extend westward into Germany and eastward into Russia.

The most extensive forest areas are in the north-east where they stretch across the frontier into Russia. Winter is the lumbering season. In spring, after the ice has melted, huge timber-rafts travel down the Niemen and Vistula to saw-mills and lumber-yards

along their banks, while much timber is also sent to Danzig for export. The Vistula is linked with the Oder by a canal (running to the Netze), but apart from its use for floating timber this river, in common with most others in Poland, is now but little used for transport.

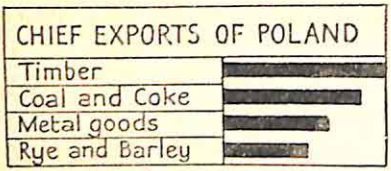


FIG. 145.

Rye, potatoes, sugar-beet, and flax are the chief crops. The bulk of the rye is made into 'black' bread, one of the staple foods of the peasants in Eastern Europe. The best potatoes are used for human consumption, but many are fed to pigs, of which there are some 7,000,000 in the country. Sugar-beet is grown mainly in the west. Cattle are bred for meat and dairy purposes, and, as in Denmark, the latter industry is associated with co-operative methods.

Warsaw (1¼ millions), the capital, stands in the middle of the Northern Plain, on the high left bank of the Vistula. It is an important route centre, railway junction, and airport. Railways and air routes go westward through *Poznan* (Posen), a metallurgical centre, to Berlin; southward to Krakow; eastward but north of the Pinsk marshes to Moscow; and north-east through Wilno to Leningrad. South-west of Warsaw is *Lodz* (600,000), a great cotton and woollen manufacturing city.

Danzig, at the mouth of the Vistula, the natural outlet for Poland, exports timber, coal, and dairy produce. Owing to its predominately German population, it was, by the Treaty of Versailles (1919) constituted a Free City under the League of Nations, but after the Second World War it was transferred to Poland. *Gdynia* lies on the west of the Gulf of Danzig. *Stettin* is the port for the Oder.

EXERCISES

1. Describe the position of the chief Polish coal-field. By what routes is the coal transported to the sea (*a*) by water, and (*b*) by rail? In each case name the port of export. Name the chief mining centres, and show their position on a sketch-map.

2. Divide Poland into three natural regions. Give a description of the most northerly of these regions under the headings: relief, drainage, climate, crops, and towns.

3. In normal times Germany does a large trade with Poland. Suggest as many reasons for this as you can, mentioning the chief goods exchanged.

CHAPTER XV

GERMANY AND THE DANUBE LANDS

GERMANY

After the Franco-Prussian War (1870–1), the twenty-six states into which Germany was divided united to form an empire under the leadership of Prussia. The progress made by Germany during the next forty-three years was remarkable. Thanks to the development of her mineral resources, she became one of the leading industrial countries; her population increased rapidly, and she acquired colonial possessions. After her defeat in the First World War (1914–18), Germany ceased to be an empire and became a republic. She lost Alsace and Lorraine, which were restored to France; a belt of territory in the east, which was transferred to the new republic of Poland; and all her colonies. The decade preceding the Second World War (1939–45) saw the rise in Germany of an aggressive National Socialist (Nazi) government under a dictator, Adolf Hitler, which embarked on a policy of expansion that ultimately led to war. In March 1938 Germany annexed Austria. In October 1938 she annexed the Sudeten districts of Czechoslovakia on the plea that these marginal areas were inhabited mainly by Germans. In March of the following year German troops marched into Bohemia, which with Moravia was declared a German protectorate, while Slovakia became a puppet state. On 1 September 1939, by her ruthless invasion of Poland, Germany again plunged Europe into a war that once more developed into a global conflict. After the defeat of Germany in May 1945, Austria and Czechoslovakia regained their freedom. Poland ceded a belt of territory in the east to Russia, but acquired a considerable portion of eastern Germany by extending her frontiers west towards the Oder and its tributary the Neisse.

The part that Germany will play in the future life of Europe is as yet far from clear, but her industrial output has been restricted to ensure that it will not again be directed towards preparation for war. Present-day Germany stretches from France and the Low Countries eastward to Poland, and from the North Sea and the Baltic southward to the frontiers of Switzerland, Czechoslovakia, and Austria.

Climate and Vegetation. Though the prevailing winds over most of Germany blow from the south-west, they are neither so strong nor so constant as those of North-West Europe. The climate is

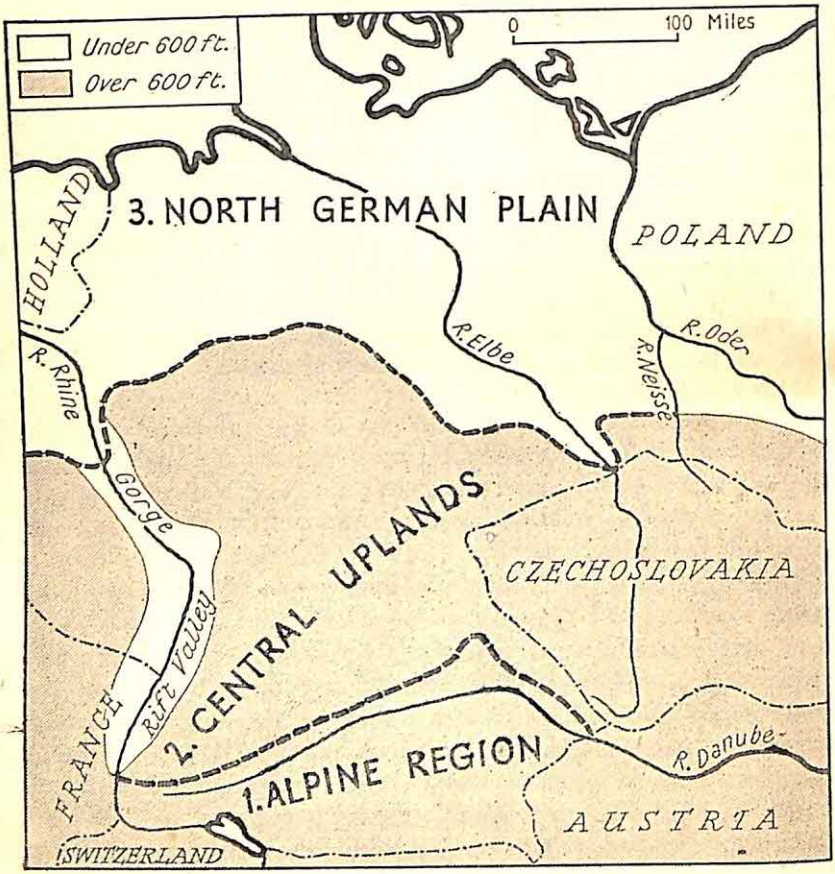


FIG. 146. Germany: Natural regions.

transitional between the oceanic type of Western Europe and the continental type of Russia. The summers are warm with moderate rainfall: the winters cold with heavy snowfalls in Eastern Germany. The increasing elevation from north to south has the effect of equalizing temperatures throughout the country. Thus at Berlin the mean January and July temperatures are 31° F. and 65° F.

respectively, while at Munich the corresponding temperatures are 27° F. and 63° F.

In Germany, as in most parts of Europe, much forest, marsh, and moorland has been reclaimed for agriculture and pastoral land. But thanks to scientific afforestation more than one-quarter of the country is wooded, the most extensive areas being in the south. In the wetter and warmer areas beeches, oaks, and other deciduous trees thrive; but pines are much more widely spread: they do well on indifferent soils and at relatively high elevations, while on account of their quicker growth they have a greater economic value.

Germany proper may be divided into three natural regions: (1) the Alpine Region; (2) the Central Uplands, including the Rift Valley and Gorge sections of the Rhine; and (3) the North German Plain.

(1) **The Alpine Region,** which stretches from the foothills of the *Alps* across the *Alpine Foreland* to the Danube, is strewn with morainic material deposited by former glaciers, and with alluvium spread by post-glacial rivers. From the Alps descend swift tributaries of the Danube including the Lech, Isar, and Inn, whose waters have been harnessed for hydro-electric power. Much land has been cleared for cultivation, but forests are still a characteristic feature of the landscape, and saw-milling, paper-making, and peasant crafts, such as the carving of wooden toys, are important industries. The nature of the relief precludes the large-scale cultivation of cereals, but the soils with their varied mineral content support barley, wheat, hops, and sugar-beet, while in the well-watered meadows are grazed many dairy cattle, whose milk is made into butter and cheese. Settlement is confined to the valleys, where are found the few large towns and villages.

Munich (735,000), the capital of Bavaria, stands beside the Isar. Placed in the midst of a rich hop-growing and mixed farming district, it has for centuries been famous for its beer. Hence the construction of brewing and agricultural machinery are among its leading industries, as too is the building of locomotives. *Augsburg*, on the Lech, uses local hydro-electric power in its cotton and light metal industries; *Regensburg*, standing at the great northward bend of the Danube, is a route centre.

(2) **The Central Uplands** are a region of great variety both in

structure and relief. The streams flow in all directions, and, except for the Rhine valley, there is no really outstanding topographical feature.

In its course from Basle to Bonn the *Rhine* may be divided into two sections: (*a*) The *Rift Valley*, lying between the Black Forest Range and the Vosges and their northern prolongations, extends from Basle to Mainz. At Mainz the Rhine turns west, flowing along the foot of the Taunus Mountains, whose vineyards have for centuries been noted for their wine. (*b*) At Bingen the Rhine turns north and enters its *Gorge*, which is narrow as far as Coblenz, where the Moselle enters the main stream, but broader from this town to Bonn, where the hills recede and the Rhine leaves the uplands and enters its lowland course.

The Central Uplands are well forested, pines being the prevailing trees. Vines are widely grown on the lower slopes of such ranges as the Black Forest and the Vosges (France). Wheat, maize, and tobacco are important crops. There is considerable dairying in the valleys, while sheep are grazed on the uplands.

Among the chief German towns in the Rhine valley are *Mannheim* (275,000), a large river port at the confluence of the Neckar and the Rhine; with Ludvigshaven—noted for its chemical industries—on the opposite bank of the main stream; and the university town of Heidelberg, on the Neckar; *Mainz*, opposite the point where the Main joins the Rhine; and *Frankfurt* (555,000), 'the ford of the Franks', a short distance up the Main. Outside the valley and its margins, the principal town is *Nürnberg* (410,000), whose command of routes made it an important commercial city in the Middle Ages. It manufactures electrical apparatus and glass, for like so many other towns in Central and Southern Germany it specializes in the making of goods of high value in proportion to their bulk.

Germany's chief industrial areas are found on the coal-fields lying along the northern edge of the Central Uplands. The *Ruhr coal-field*, the greatest in Europe, forms one vast industrial area stretching from the Rhine ports of *Düsseldorf* (500,000) and *Duisberg-Ruhrort* (440,000), eastward through the Ruhr basin to Dortmund. Iron ore from Lorraine, the Saar basin, and Sweden is used in the iron and steel works at *Essen* (650,000). The coal-field is an important centre for cotton, woollen, silk, and artificial silk goods; while Solingen, in the Sëig valley to the south, is noted for its cutlery.

On the *Saxon coal-field* there are important iron and steel works at *Chemnitz* (350,000) and Zwickau, both of which are leading textile centres. The small *Aachen coal-field* is a prolongation of the Franco-Belgian coal-field. The *Saar coal basin* is rich in iron ore. Transferred by France to Germany in 1935, its future political control has not yet been decided.

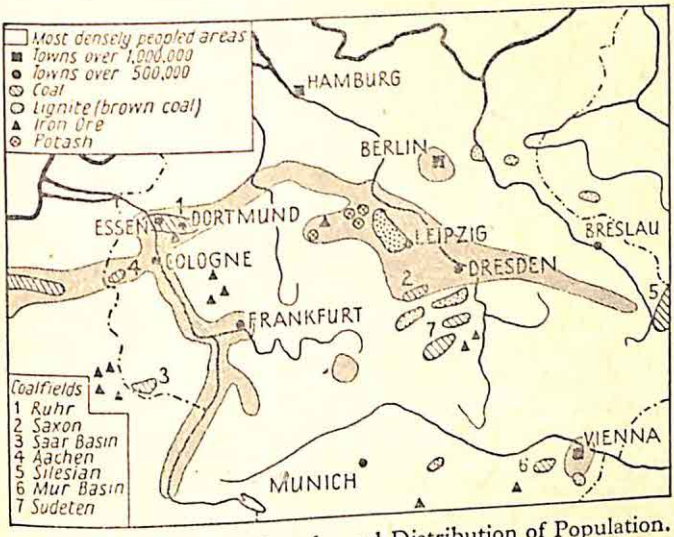


FIG. 147. Germany: Minerals, and Distribution of Population.

(3) **The North German Plain,** stretching from the Central Uplands to the North and Baltic Seas, is crossed by the Vistula (Poland), Oder, Elbe, Rhine, and other streams whose general direction is from south-east to north-west. Many of their tributaries, such as the Warta, a feeder of the Oder, flow in east-to-west valleys which have been utilized for the construction of canals linking the main streams. The Rhine is linked by the *Midland Canal* with the Elbe, and thence by other canals with Berlin, the Oder, and the Vistula. In Germany, as in France, rivers and canals are used for transport to a much greater extent than they are in the British Isles.

On the northern plain much marsh and moorland have been reclaimed for agriculture, and poor soils improved by the addition of fertilizers, such as potash, of which there are valuable deposits round Hanover, Stassfurt, and Halle. Not only is potash an extremely

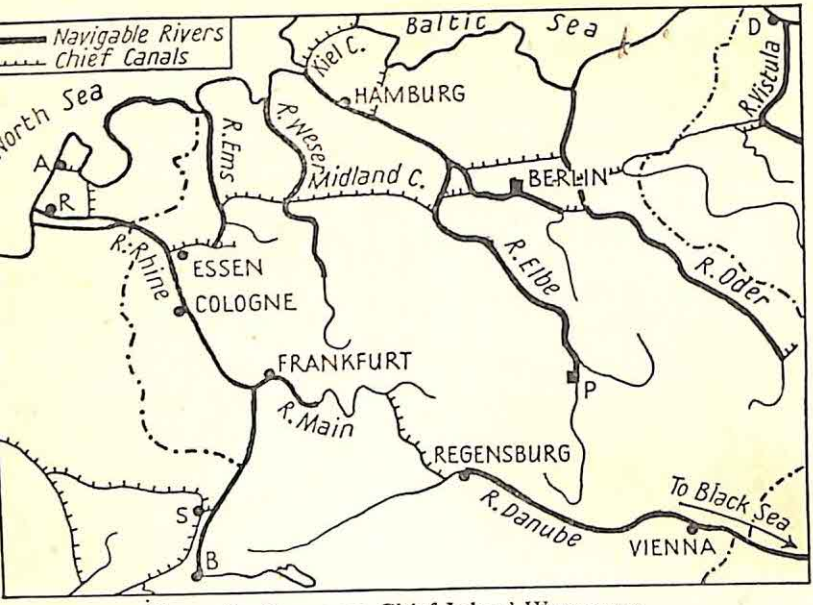


FIG. 148. Germany: Chief Inland Waterways.

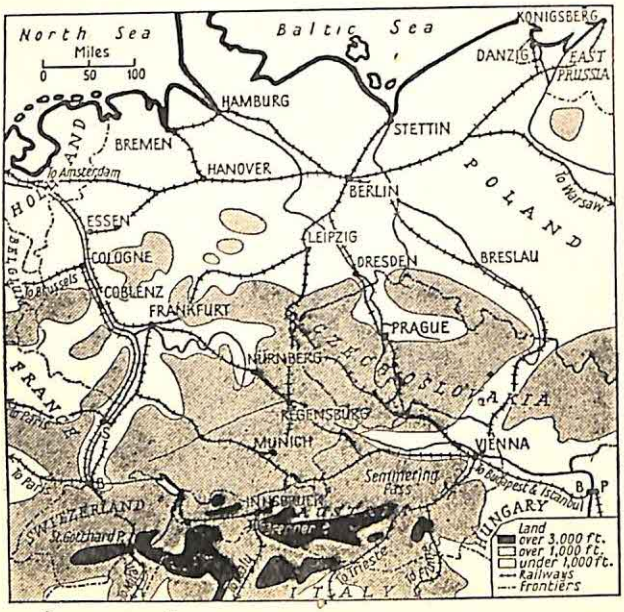


FIG. 149. Germany: chief railways.

valuable fertilizer, but carbonate of potash is used in bleaching and dyeing, soap-making and calico-printing. Thus these potash deposits have done much to assist German agriculture, and have helped to lay the foundations of the great chemical industries. As climate, configuration, and soils are similar over large areas, so too are crops. Rye and oats are the chief cereals, but wheat is grown on the better soils. Sugar-beet and potatoes are widely cultivated, the waste of

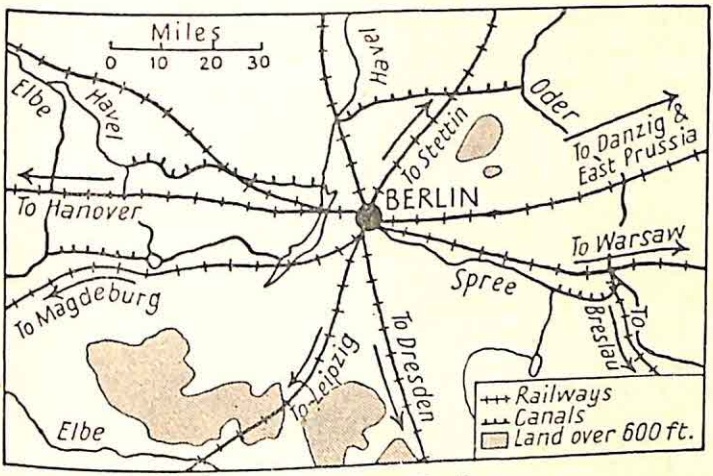


FIG. 150. Site of Berlin.

the former and much of the latter crop being used for feeding stock, notably pigs and cattle, which are widely reared, the bulk of the latter being found in the west. Sheep are widely grazed in the east, while many horses are bred in the southern portion of the Jutland Peninsula.

At the junction of the Central Uplands and the Northern Plain are a number of important towns. *Cologne* (756,000), the fourth largest town in Germany, stands at the head of ocean navigation on the Rhine at a point where land routes, coming down the Rhine valley, meet others running from west to east along the foot of the uplands. *Dresden* (642,000), the capital of Saxony, placed where the Elbe enters the plain, is noted for its artistic treasures; but the famous china is manufactured at Meissen, some dozen miles distant. *Leipzig* (715,000), to the west of Dresden, is a great publishing centre.

Berlin on the Spree, the capital of Germany, ranked as the fourth largest city in the world, but during the Second World War much of it was laid in ruins. Formerly it was the leading manufacturing and commercial centre in Germany. Its central position in the Northern Plain, midway between the uplands and the Baltic, has helped to make it the focus of Germany's rail, road, water, and air routes.

The old Hanse town of *Lübeck*, and other Baltic ports are usually blocked with ice in winter, but the harbours of Bremen and Hamburg are not frozen, though ice-breakers have to be used to keep the latter open. *Hamburg* (1,130,000), the chief port and second largest town in Germany, stands at the head of tidal navigation on the Elbe; *Bremen* lies some 60 miles up the Weser. The bulk of the foreign trade of Germany passes through these ports, for as they face the North Sea the world is their market and the whole of Germany their hinterland. Both carry on a considerable Baltic trade through the *Kiel Canal*; and, owing to the excellent system of inland waterways, heavy and bulky goods can be forwarded cheaply by water to most parts of Germany. Besides being entrepôt ports, Hamburg and Bremen are industrial centres, as, by manufacturing imported raw materials at the port of entry, further transport costs are saved.

CZECHOSLOVAKIA

The Czechs, a highly progressive people, and the Slovaks, mainly of peasant stock, belong to the western branch of the Slav race. The Republic of Czechoslovakia was one of the new states carved out of the Austro-Hungarian Empire after the First World War. Its independence was, however, short-lived. In October 1938 Germany annexed the marginal Sudeten districts of Bohemia, which were inhabited mainly by German-speaking peoples; Poland occupied part of the Teschen coal basin; and Hungary seized a portion of Slovakia and the whole of Ruthenia. In March 1939 Germany occupied the rest of the country, which remained under her yoke until her defeat in the Second World War, when Czechoslovakia regained her independence.

Czechoslovakia has a curiously elongated shape: it extends for some 500 miles from west to east, but nowhere does its breadth exceed 200 miles. Forested mountains separate the country from Germany, Austria, and Poland, but the frontier with Hungary is ill-defined. Out of every 100 acres in Czechoslovakia 40 consist of

arable land, 17 of pasture, and 33 are clad with forests, which yield timber, wood-pulp, and tan-bark for leather industries. There are supplies of coal, iron, and water-power in Bohemia and Moravia, where manufacturing is highly developed. We may divide Czechoslovakia into three regions: (1) Bohemia, (2) Moravia, and (3) Slovakia.

Bohemia. The ancient crust-block of Bohemia, a diamond-shaped plateau almost encircled by wooded ranges, is an undulating region drained north by the Elbe and its tributaries, the chief being

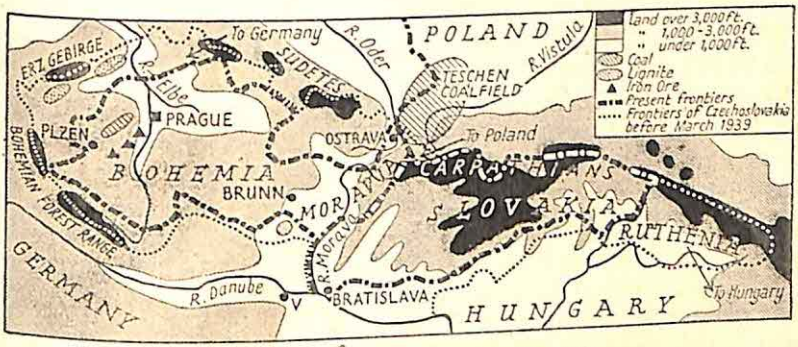


FIG. 151. Bohemia, Moravia, Slovakia.

the Vltava (Moldau). Many cattle and pigs are raised and sheep are grazed on the uplands. Crops include wheat, barley, rye, potatoes, and flax; sugar-beet, widely grown, especially in the Elbe and Vltava valleys, and hops cultivated mainly around *Plzen* (Pilsen), famous for its breweries and iron and steel works. Timber, grain, dairy produce, and sugar-beet yield an export-surplus. *Coal* is mined on the slopes of the Erz Gebirge (Ore Mountains) round Teplice and Falknov; and *iron ore* is worked along a belt stretching from a point south of Prague towards Plzen. 'Porcelain earths' supply raw material for the porcelain industry at *Karlsbad* (also a noted spa) and other centres, and local sands are used for making the famous Bohemian glass.

Prague (Praha), the capital, a city with 850,000 inhabitants, on the Vltava, stands on the main line from Vienna to Berlin, which leaves Czechoslovakia by the Elbe Gap between the Erz Gebirge and the Riesen Gebirge. It has large breweries, distilleries, sugar-refineries,

and iron and steel works, and manufactures textiles and footwear. Much of its overseas trade is carried on through Hamburg, many of the heavier commodities being transported by barge via the Vltava and Elbe.

Moravia. The valley of the Morava forms an easy route from the Danube northward to the valleys of the Oder and the Vistula by way of the Moravian Gate, the passage between the Sudetes and the Carpathians. The crops of Moravia are similar to those of Bohemia, and dairying, too, is important. *Ostrava Moravska* is the chief centre on the *Teschen coal- and iron-field*, which forms part of the Upper Silesian coal basin. *Brno* (Brunn), on the west side of the Morava valley, manufactures iron and steel goods and textiles. *Zlin* is noted for its boot and shoe factories.

Slovakia, an upland region stretching from the Carpathians down to the Hungarian frontier, the Danube, and the lower Morava, is a forested area in parts of which wild boars, wolves, and bears are still found. The peasants grow rye and oats, feed pigs on acorns and beech mast, and graze sheep. Most of the isolated towns lie in the valleys. *Kosice* is a lumber and paper-making centre. *Bratislava* (Pressburg), a river port on the Danube, exports timber and dairy produce to the Danube lands. It mills flour and refines sugar and petroleum, the latter brought by river-tanker or rail from Rumania.

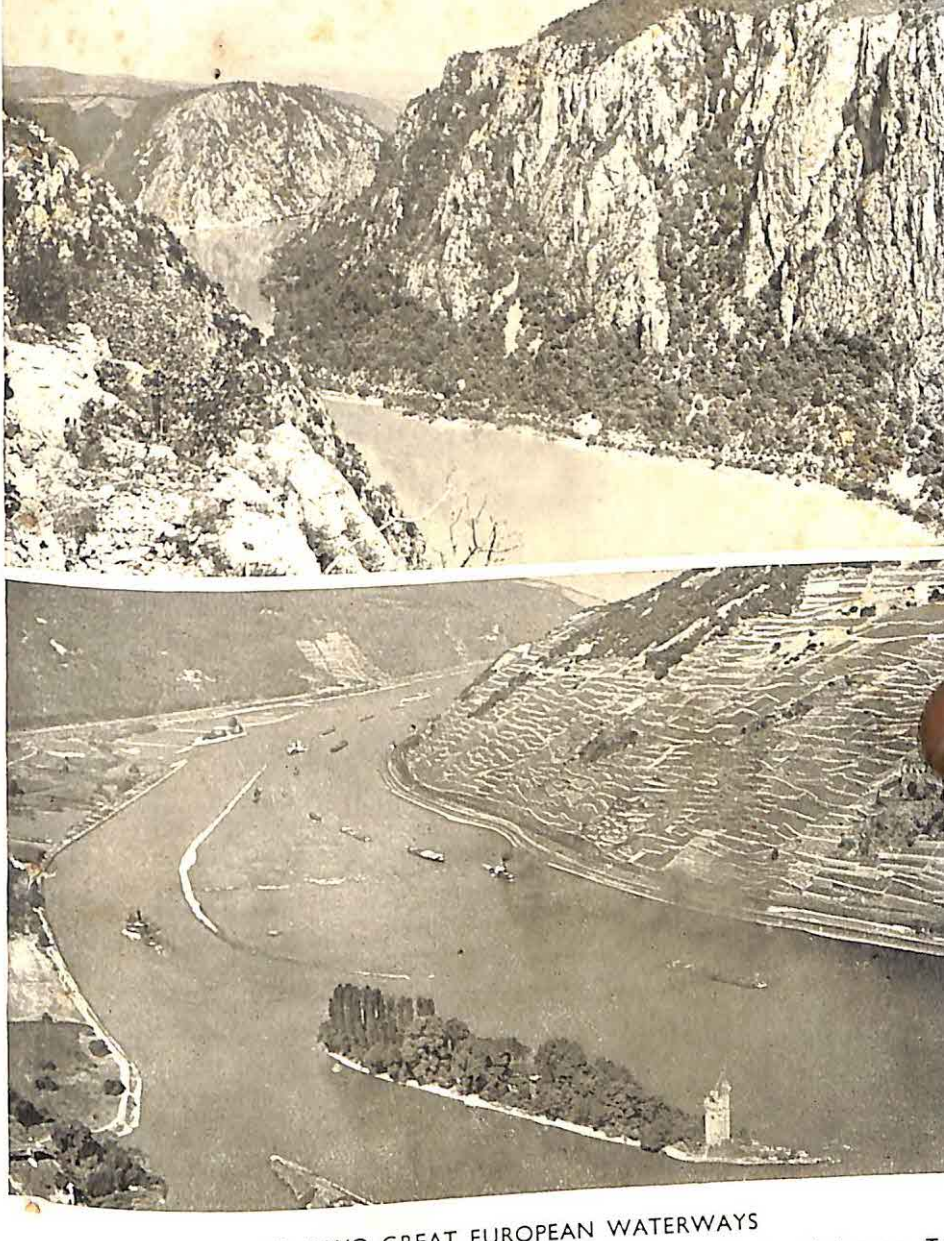
Ruthenia, or Carpatho-Ukraine, a mountainous and unproductive region, was formerly included in Czechoslovakia, but was ceded by that country to Russia after the Second World War.

EXERCISES

1. Draw a sketch-map of Germany showing the *three* natural regions into which the country may be divided. In the case of *one* of the more important regions describe the principal occupations of the inhabitants and show how they are influenced by geographical conditions.

2. Describe the position of the chief German coal-fields particularly as regards neighbouring highlands and access to navigable waterways. In the case of the most important of the coal-fields, name the chief manufacturing industries and the principal towns concerned, and account so far as you can for the location of these industries in this vast industrial area.

3. (*a*) Draw a sketch-map of the Rhine. (i) Show the main stream, and *four* important tributaries; (ii) shade the high land; (iii) name the Rift Valley and the uplands bordering it; and the Gorge; (iv) show by suitable shading, and name, *one* important coal-field; (v) mark, and name, *six* large German, *one* French, *one* Swiss, and *one* Dutch town situated on the main stream or its tributaries; (vi) show by arrows the chief routes leading to the Rhine



17. TWO GREAT EUROPEAN WATERWAYS

(*Below*) The Rhine Gorge, near Bingen, where every mile is touched with beauty. Tu
may be seen pulling heavily laden barges upstream. Compare the terraced hill-sides w
the steep cliffs of the Iron Gate (*above*) where the Danube forces its way between t
Carpathians and the Balkan Heights. Here the river is virtually impassable for shipp
and a canal has been constructed along one side of the Gorge.

18. HUNGARY—THE DALMATIAN COAST

(*Above*) Cattle wells on the Hungarian Plain. The buckets, which are attached to the thin nds of the beams, are raised or lowered by pulling down, or releasing, the thick ends of he beams. (*Below*) is a general view of the Bocche di Cattaro, a complex opening in the almatian coast of Yugoslavia, where three submerged longitudinal depressions are linked y transverse openings. These transverse and longitudinal depressions, for which the

valley from France (two), Holland, Belgium, North-East Germany, Switzerland, and the Upper Danube. (*b*) Name *four* important crops grown in the basin. (*c*) State *three* geographical reasons that help to account for the great importance of the Rhine to Germany.

4. Among the industries of Hamburg are the manufacture of (i) iron and steel goods, (ii) chocolate, (iii) oil-cake, and (iv) the refining of sugar. Account for the location of these industries in this city.

5. Describe the part played by geographical conditions in the location and development of Munich, Cologne, Frankfurt-on-Main, and Dresden. Illustrate your answers by sketch-maps.

6. Draw a sketch-map of Czechoslovakia. On your map insert and name Prague and *four* other important towns, including a river-port on the Danube. Show the chief railways leading from Prague.

7. Show how the environment affects the occupations of the people living in the Bohemian region.

AUSTRIA

Before the First World War, Austria was the predominant partner in the Austro-Hungarian Empire. Present-day Austria is about twice the size of Switzerland and has a population one and a half times as great. Like Switzerland, Austria is mainly an Alpine country, and though the Austrian are lower than the Swiss Alps they rise above the snow-line, and contain a number of glaciers, the most famous being the Gros Glockner in the Austrian Tyrol. Austria is traversed by the Danube whose valley forms an important route. Its Alpine tributaries include the Inn and the Enns, which flow across the Alpine Foreland (see p. 225), and the Drave and its tributary the Mur, the former entering the main stream in Yugoslavia. Below *Linz*, a river-port and the capital of Upper Austria, the Danube flows through the Austrian Gate, a magnificent gorge leading to the Vienna Basin, the only lowland area in the country.

The lower slopes of the Alps are clad with forests, which furnish timber for saw-, pulp-, and paper-millings, furniture, peasant crafts, and houses, which outside the large towns are constructed largely of wood. In spring cattle are driven up from the valleys to the *alps*, or mountain pastures (compare Switzerland), where they remain until autumn. Upland crops include rye, oats, and potatoes. Wheat and sugar-beet are grown in the Vienna Basin, where, as in the Mur Valley, the sun-facing slopes are terraced for vineyards. Minerals include lignite mined in the Mur Valley, near Graz, and around Eisenerz. There are iron and steel works at *Graz*, the capital of

Styria, and *Klagenfurt*, near the Italian frontier. The Salzkammergut, the area round *Saltzburg*, is noted for its deposits of salt. Many of the mountain streams have been harnessed for power, used for industrial and domestic purposes and for driving trains on the railways. *Innsbruck*, the capital of the Austrian Tyrol, standing in the valley of the upper Inn, is an important centre for tourists of whom thousands normally visit the Tyrol each year attracted by the beautiful mountain scenery. Innsbruck commands the route by the Brenner Pass to Italy and that by the Arlberg Pass to Switzerland.

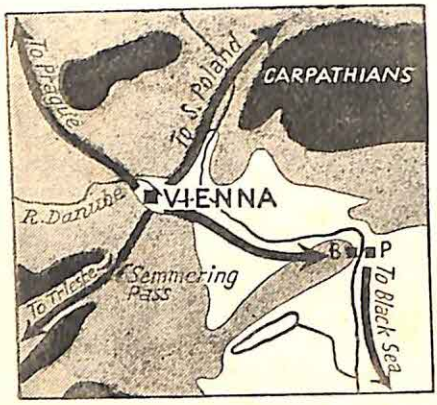


FIG. 152. Site of Vienna.

Nearly one-third of the people of Austria live in *Vienna*, the capital, which, partly owing to its control of communications, is still an important city even though it is no longer the metropolis of a large empire. Westward goes the way through the Austrian Gate to Munich and Innsbruck and Switzerland. Northward a route runs up the Morava valley to the Moravian Gate, whence it branches east to Southern Poland and north-west to Berlin. A more direct route from Vienna goes north-west to Berlin via Prague, the Elbe valley, and Dresden. The route to Trieste and the Adriatic runs by the Semmering Pass and Graz.

HUNGARY

The Hungarians are descended from Magyars and other pastoral tribes, who migrated from the Asiatic steppes, crossed the Carpathian passes, and settled on the Hungarian Plain, where the grasslands, termed *pusztas*, provided an environment not unlike that of their original home.

The dismemberment of the Austro-Hungarian Empire saw Hungary shorn of two-thirds of her territory, which was distributed between Rumania, Yugoslavia, and Czechoslovakia. Hungary, unlike Austria, is mainly a land of fertile plains. Within her present restricted frontiers there are, however, few forests, little water-power, and no

valuable minerals, except iron ore mined near *Miskolc* on the slopes of the Carpathians, and coal worked along the edge of the Bakony Forest Ridge and near *Pécs* in the south-west.

The Hungarian Plain is watered by the Danube, which in this portion of its course receives the Drave and other tributaries from the Austrian Alps, and the turbulent Tisa (Theiss) from the Carpathians. On entering Hungary, the Danube crosses the *Little Hungarian*

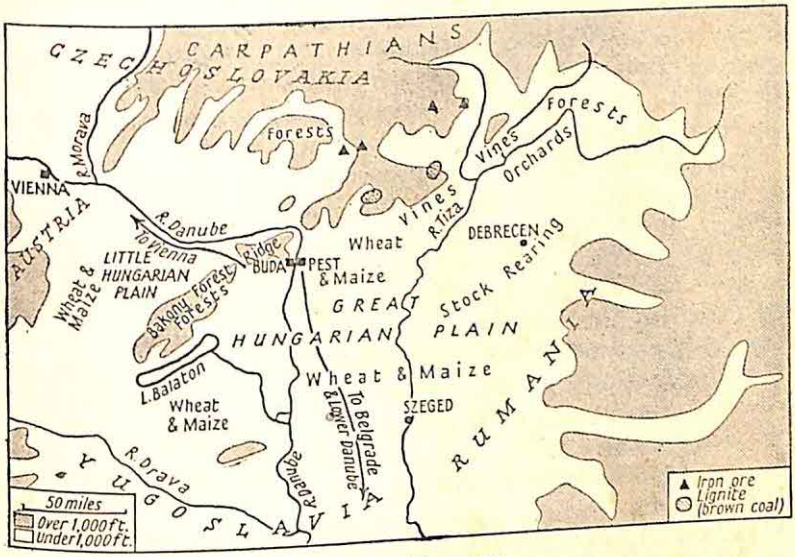


FIG. 153. Hungary.

Plain, which stretches from the eastern frontier of Austria to the Bakony Forest Ridge, an outlier of the Alps, at whose eastern foot lies Lake Baleton. Passing through the Carpathian Gate (between the Bakony Forest Ridge and the Carpathians), the Danube enters the *Great Hungarian Plain*, or *Alföld*, flowing southward to cross the frontier into Yugoslavia.

The Alföld stretches from the Balkan Heights northward to the Carpathians, which from Bratislava (Czechoslovakia) sweep in a great semicircle, first north-east, then east, and finally south-west, approaching the Danube again at the gorge of the Iron Gate. In the course of centuries the steppe-like character of the Alföld has been

modified: large tracts of swampy land have been drained and much grassland has been brought under the plough. To-day the Alföld is one of the great granaries of Europe, for its rich alluvial soils, together with rainy springs and hot sunny summers, make it ideal for the cultivation of wheat and maize. Normally there is a surplus of wheat and flour for export. Much maize is fed to pigs and poultry which are reared in large numbers. Sugar-beet and tobacco are also cultivated, as well as vines grown on the lower slopes of the Bakony Forest Ridge and those of the upper Tisa valley, which is famous for Tokay wine. The chief stock-rearing area lies around Debrecen, where vast numbers of cattle, sheep, and horses are grazed on the *pusztas*. In recent years much has been done to improve the blood-stock, and dairying has become important.

The population is not spread more or less evenly over the plain as in most agricultural regions, but is concentrated in enormous villages, or rather groups of villages, such groups not infrequently containing as many as 40,000 inhabitants. This unique arrangement is a survival from the days when the plains-folk, exposed to attack by their less prosperous neighbours in the surrounding mountain areas, gathered together for safety in huge settlements, which still show traces of their original lay-out as tent-encampments. *Debrecen* consists of a modern town closely encircled by primitive farming villages, the whole having a population of 122,000.

One of the few large towns in Hungary of the usual European type is *Budapest*, the capital. Standing at the entrance to the Carpathian Gate, it is a focus of routes approaching it from all parts of the plain. Buda stands on low hills overlooking the Danube: Pest, the commercial quarter, is spread along the low left bank of the river. Its industries include flour-milling, distilling, and tanning; it also manufactures agricultural machinery and textiles, and refines petrol (compare Bratislava).

EXERCISES

1. Give an account of the farming activities of the Hungarian Plain.
2. Describe a journey by steamer from Regensburg to Belgrade, mentioning the principal towns you would pass, and the different kinds of country you would see.
3. Compare the occupations of the North German Plain with those of the Hungarian Plain. Account as far as you can for the differences.

YUGOSLAVIA

After the First World War, Serbia and Montenegro, with Bosnia, Dalmatia, and other western provinces of the Austro-Hungarian

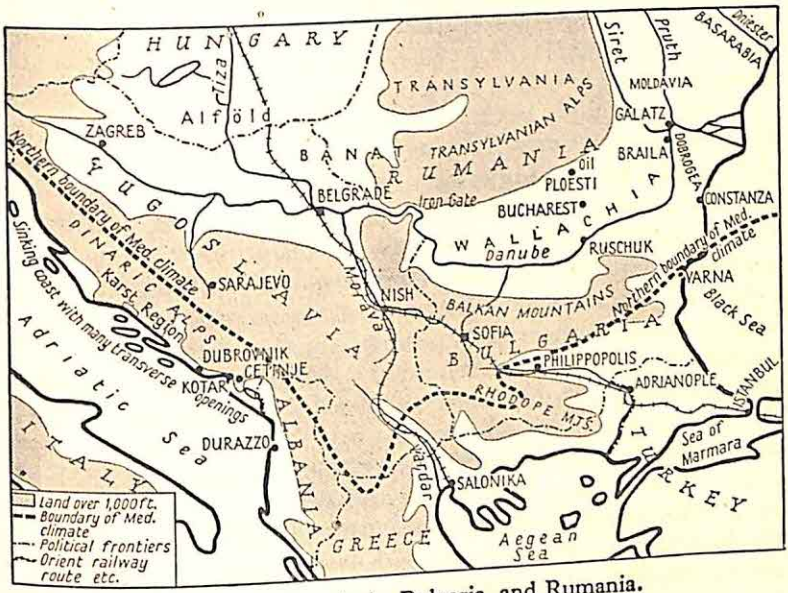


FIG. 154. Yugoslavia, Bulgaria, and Rumania.

Empire, were united to form the kingdom of Yugoslavia, a state somewhat more than three-quarters the size of the British Isles, with a population of some 14,000,000. A large proportion of the country is mountainous: the highlands in the east are part of the Balkan Heights, those in the west form the Dinaric Alps. About a third of Yugoslavia is clad with forests of oak, beech, and pine yielding timber, wood for fuel, and acorns and beech-mast for feeding pigs, which, together with sheep, cattle, horses, goats, and poultry, are widely reared. The country has considerable mineral resources, including low-grade coal as well as iron, copper, and lead, but as yet little developed; Yugoslavia remains primarily an agricultural state.

There are three major Natural Regions: (1) the Dinaric Lands; (2) the Mountainous Central Region; and (3) the Danube Lowlands.

(1) **The Dinaric Region** includes the former Austrian provinces of Bosnia, Herzegovina, and Dalmatia. The limestone ridges of the Dinaric Alps, which run parallel to the Adriatic, are separated by deep longitudinal valleys. They form a region of the *Karst type*—a rock-strewn land with bare grey limestone hills between which lie plateaus and valleys, like that of the Narenta, cut deep into the soluble rock. Shepherds pasture their flocks on the short, scanty herbage of uplands where the rain never stays, but sinks through the porous ground to richly wooded and cultivated valleys far below. In such a valley stands Sarajevo, on a tributary of the Bosna. East of this town the railway crosses the uplands to the Morava valley: west it descends to that of the Narenta, which it follows, past Mostar, to Dubrovnik on the deeply indented Dalmatian littoral, fringed with many islands, the peaks of a submerged mountain range.

The sinking of the Dalmatian coast allowed the sea to penetrate inland, through transverse openings, into the longitudinal valleys between the ranges. Thus it formed a series of complicated openings (called *vallonoi*) of which the best known is the Boche di Cattaro, at the head of which stands Kotar (Cattaro). From this picturesque town a road winds up to *Cettinje*, the capital of the former state of Montenegro. Farther north are the ports of *Dubrovnik* (Ragusa), *Split* (Spalato), and *Fiume* (formerly Italian), which is now the chief outlet on the Adriatic for Yugoslavia. Its climate sets Dalmatia apart from the rest of Yugoslavia, for it has the hot, dry, sunny summers and the mild rainy winters associated with the Mediterranean region. The lower seaward slopes of the mountains are clad with subtropical vegetation, while in the valleys olives, plums, vines, and mulberries are grown.

(2) **The Mountainous Central Region** corresponds roughly to the former kingdom of *Serbia*, which was centred round the Morava and Upper Vardar valleys. In these valleys considerable quantities of maize and wheat are grown, but the greater part of this region consists of forests and waste land. The Morava and Vardar valleys form an important route, followed by the railway from Belgrade via *Nish* (whence the Orient line to Sofia and Istanbul runs up the Nishava valley) to the Greek port of Salonika.

Belgrade (240,000), the capital of Yugoslavia, stands on high ground overlooking the confluence of the Danube and the Save, and a little to the west of the point where the Morava joins the main stream. Somewhat similarly placed, in the transitional zone between

the mountains and the Danube lowlands to the north, is *Zagreb* (185,000), on the Save, an ancient city which is now the chief manufacturing centre in the kingdom.

(3) Forming part of the Alföld, the Yugoslavian portion of the *Danube Lowlands* ranks with the Morava valley as the great grain-growing area of the country.

BULGARIA

The greater part of Bulgaria is mountainous, consisting of the forested Balkan Heights and the Rhodope Mountains. There are, however, two extensive lowland areas: (*a*) the plain stretching from the Balkan Heights to the Danube, and (*b*) the Maritsa valley in the south-east. Though rye, oats, potatoes, and other hardy crops are grown in the upland valleys, the Danube and Maritsa lowlands are the most important cultivated areas. Much wheat and maize are grown in both lowlands. Other crops are flax, sugar-beet, cotton, and sunflowers, raised for their seeds which yield oil. In the more sheltered Maritsa lowland tobacco (the chief export) and mulberries (for silkworms) are also cultivated. In the southward-facing valleys opening to the Maritsa are vineyards and plum orchards, and in some are rose gardens connected with the production of attar of roses.

Sofia (288,000), the capital of this peasant state, lies where a number of routes converge on the Isker Basin, including those followed by the Orient Line to Plovdiv and Istanbul. *Plovdiv* (Philippopolis), the chief town in the Maritsa valley, is also linked by rail with *Ruse* (Ruschuk), Bulgaria's port on the Danube, and *Varna*, her Black Sea port. Study Fig. 155 and also the map in your atlas and note how the Orient Railways follow the valleys.

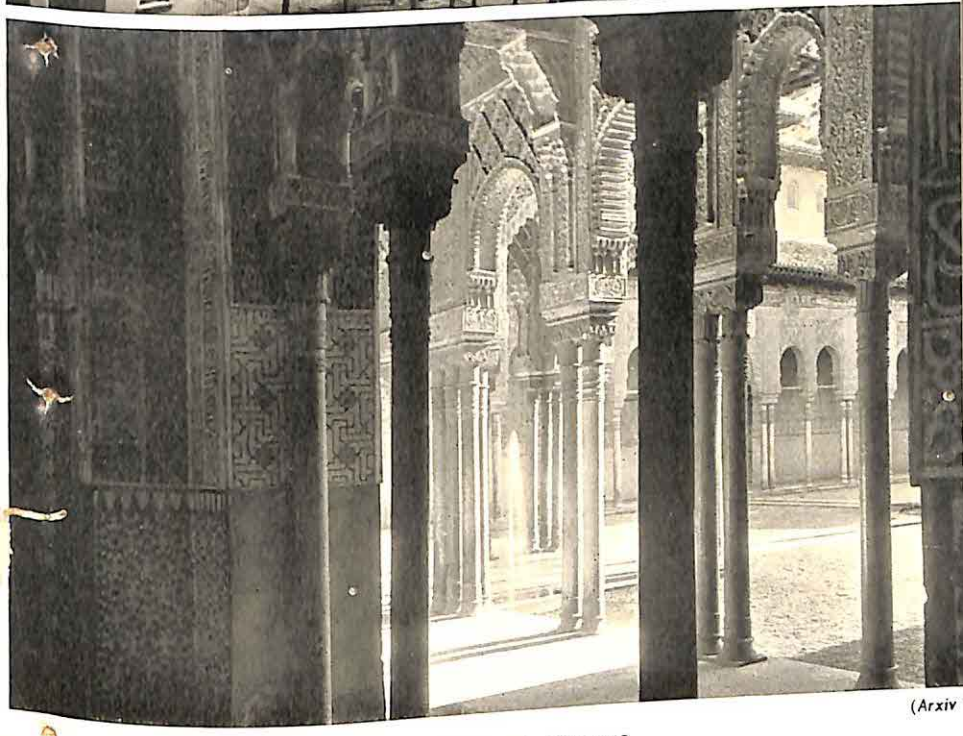
RUMANIA

After the First World War the area of Rumania was doubled mainly by adding territory from Hungary. The Rumanians, who speak a language derived from Latin, claim descent from Roman colonists. The population is, however, mixed and includes German and Hungarian minorities. Most of the people are engaged in agriculture and forestry. We may divide Rumania into three main regions: (1) the Central Mountains; (2) the Plains stretching from the mountains to the lower Danube Basin; and (3) Transylvania and the Banat.

(1) **The Central Mountains**, consisting of the Transylvanian Alps and the southern part of the Carpathians, form a barrier between the Danube lowlands and Transylvania. From them numerous streams, some harnessed for hydro-electric power, descend to the Danube. The mountains are thickly forested with beech and oak trees at lower elevations and pines and other conifers at greater heights. In spring timber is floated down the Pruth and Siret to the saw-mills at *Galatz*, a timber-exporting port near the confluence of the latter stream and the Danube.

(2) **The Plains.** The climate of the plains resembles that of the Hungarian Plain: the winters are so cold that the lower Danube is ice-bound, but the hot summers coupled with the spring rains favour the cultivation of wheat and maize, of which vast quantities are grown in Wallachia and on the fertile Black Earth Lands of Moldavia. Maize is grown principally for home consumption, but much wheat is exported. *Braila*, on the Danube, is the chief grain port. Other crops include flax, sugar-beet, and sunflowers whose seeds are pressed for oil. The steppes of the Dobrujia plateau (of volcanic formation), to the south of the Danube delta, are a pastoral area where many sheep are fed. The foothills of the Transylvanian Alps, of recent (Tertiary formation, contain important deposits of petroleum (the leading export). From *Ploesti*, the chief centre, oil is pumped through pipe lines to the Danube port of Giurgiu, and also to *Constanza*, on the Black Sea. From the latter port a railway, crossing the Danube at Cernovada, runs to *Bucharest* (800,000), the capital, whose industries —flour-milling, sugar-refining, brewing—like those of other towns on the plain, are based on agriculture.

(3) **Transylvania and the Banat.** The upland region of Transylvania is thickly forested. Cattle are bred on the upland pastures, pigs fed on the acorns and beech mast, and agriculture is confined to the valleys where are situated the towns and villages. There is much undeveloped mineral wealth, but some gold, iron, and copper are mined. Much wheat and maize are grown in the *Banat*, which forms the eastern portion of the Hungarian Plain.



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19. HISTORY IN STONES

(*Above*) Istanbul, which as Constantinople was held by Roman Emperors, as a Christian outpost, until 1453 when, as the mosques seen here remind us, it was captured by the Turks (see p. 256). Towards the end of the same century the Moors were expelled from Spain. The Alhambra (*below*) at Granada, their last stronghold, is a splendid example of Moorish architecture. The Moors attempted to portray nature in stone as they saw it in the desert, 'and the principle of columns and arches, so well seen in the Alhambra, is derived from the tents of their encampments'.

20. GREECE AND ITALY

(*Above*) Mountain and Plain in Greece. The Vale of Sparta. From their city-states, separated by barren mountains but linked by the sea, the Greeks extended their influence throughout the Mediterranean (see p. 254). (*Below*) Another phase of the Mediterranean scene—Vesuvius, the volcanic cone dominating the Bay of Naples, in eruption, seen from the edge of the crater. Vesuvius is known as a 'mixed' volcano, for besides lava it emits ashes, dust, scoriae, &c. In the eruption of A.D. 79, Pompeii was buried beneath clouds of ash, and Herculaneum under a sea of mud. The last great eruption occurred in 1929.

CHAPTER XVI

THE EUROPEAN MEDITERRANEAN LANDS

CONFIGURATION, CLIMATE, AND VEGETATION

THE formation of the Mediterranean was due to the subsidence of a considerable area between Europe, Africa, and Western Asia which allowed the ocean to penetrate far inland. This subsidence was preceded by other earth movements which resulted in the upfolding of those young mountains that, in part, encircle the Mediterranean. From Europe a series of peninsulas—the Balkan, Italian, and Iberian—project southward to the sea, where unsubmerged crust-blocks, like Corsica and Sardinia, and elevated areas, such as Sicily and Crete, remain as islands. The surrounding ranges tend to shut off the Mediterranean countries of Europe from their continental neighbours though gaps, like the Gate of Carcassonne, and valleys, such as the Rhone, form important channels of communication.

Owing to the fact that there is little tide the rivers have built up deltas. The great ports of Marseilles and Barcelona are therefore not placed actually on rivers, but at the entrances to their valleys which furnish routes inland. Throughout the Mediterranean many ports are similarly placed at the mouths of valleys, but in most cases they are cut off by mountains from communication with their neighbours, while the restricted nature of their hinterlands handicaps their development. But they are linked by the sea. Yet despite the unifying effect of the Mediterranean Sea, which enabled the Romans and Arabs to extend their Empires throughout the Basin, the ultimate tendency has always been for the marginal lands to form distinct political units.

From the time of the Phoenicians up to the Middle Ages the Mediterranean was a great commercial highway, but with the discovery of the Americas trade routes shifted to the Atlantic, and it was not until the opening of the Suez Canal that the Mediterranean once more became an important artery of trade and one of vital importance to the British Empire.

The countries round the Mediterranean form a distinct natural region, unified by their *climate*, whose outstanding features are hot dry summers, mild rainy winters, abundant sunshine even in winter,

and a small annual range of temperature. The rainfall is greatest on coastal lands facing the prevailing winter westerlies, and taking the area as a whole it diminishes from west to east. But the varied topography of the region results in notable climatic differences. Thus the North Italian Plain, hemmed in on three sides by the Alps and Apennines and opening east, has a continental climate with considerable summer rain; while the Plain of Andalusia, facing the Atlantic, has a typical Mediterranean climate.

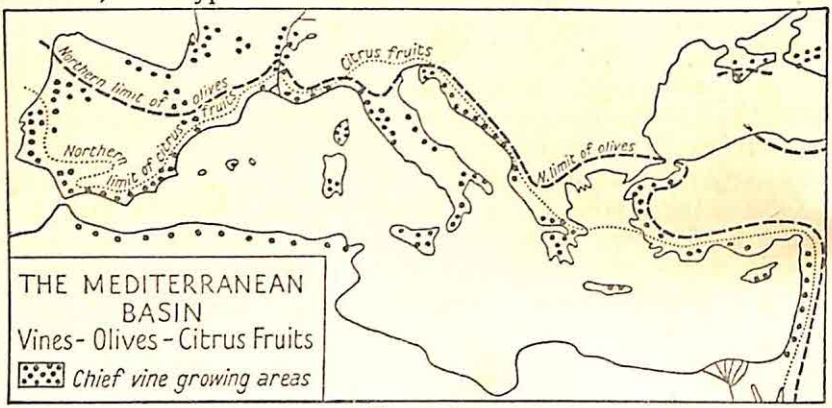


FIG. 156.

The *vegetation* is adapted to withstand the summer drought. Trees and shrubs are mainly evergreen and, like the olive, cork oak, laurel, myrtle, and arbutus, have small, thick, hairy, or oily leaves which prevent undue loss of moisture. Deciduous trees are limited to the better watered areas. There is an absence of summer pasturage suitable for cattle, though many sheep and goats are grazed on the rougher herbage of the uplands.

It has been aptly said that the Mediterranean man is a gardener rather than a farmer, for except in certain areas, like the North Italian Plain, the rugged relief prevents large-scale agriculture. Mixed farming is the rule. Of the cereals, wheat and barley are the chief. Neither requires irrigation, and barley, owing to its quicker growth, can be cultivated in areas too dry for wheat. Sown in autumn, the crops receive the benefit of the winter rains and are ready for harvesting in June. Little maize is grown on a large scale except in the North Italian Plain, where summer rains provide the necessary moisture, and on irrigated lands in South-East Spain. Rice, too, is

grown in both these areas. Typical Mediterranean crops are the vine and the olive. The long tap roots of the *vine* enable it to penetrate into the soil in search of moisture and also help it to resist frosts. The vine, which thrives on southward facing slopes, needs warm, sunny summers with but a light rainfall, and warm autumns (September 60° F.) to ripen the grapes. The *olive* requires more sunshine than the vine, but the trees can flourish in areas where the annual rainfall is as low as 8 inches, for their widespread surface roots enable them to collect the slightest moisture. But olives cannot stand cold, and even light frosts are fatal in spring. Favoured sites are the lower slopes of hills where the soils are warm and 'limy'. Spain, Italy, and Greece grow most olives, but they are also widely cultivated in Portugal and the lower Rhone valley. They are produced chiefly for their oil, which largely takes the place of butter in the diet of the Mediterranean people.

Citrus fruits, like *oranges* and *lemons*, require a slightly higher temperature than olives and a considerable amount of moisture. Thus they are chiefly found on irrigated lands in the Southern Mediterranean such as Andalusia and Sicily (lemons). Many warm temperate fruits are grown and vegetables are cultivated both as winter and summer crops, but in summer they require frequent watering.

EXERCISES

1. Draw a sketch-map of the Mediterranean. Insert and name Corsica, Sardinia, Crete, and Cyprus, and four important ports. Shade the higher lands surrounding the basin, and show by boldly drawn arrows three land and two water routes leading to the Western Basin, and two land and one water route leading to the Eastern Basin.

2. Among the principal Mediterranean crops are the olive and the vine. State fully the characteristics which enable these crops to thrive in this region. Name three important countries, or areas, for the production of each crop. State for what purposes grapes and olives are mainly used.

3. Discuss the importance of the Mediterranean sea route to the British Empire.

THE IBERIAN PENINSULA—SPAIN AND PORTUGAL

Though the Pyrenees tend to isolate the Iberian Peninsula from the rest of Europe, important routes run round both ends of the

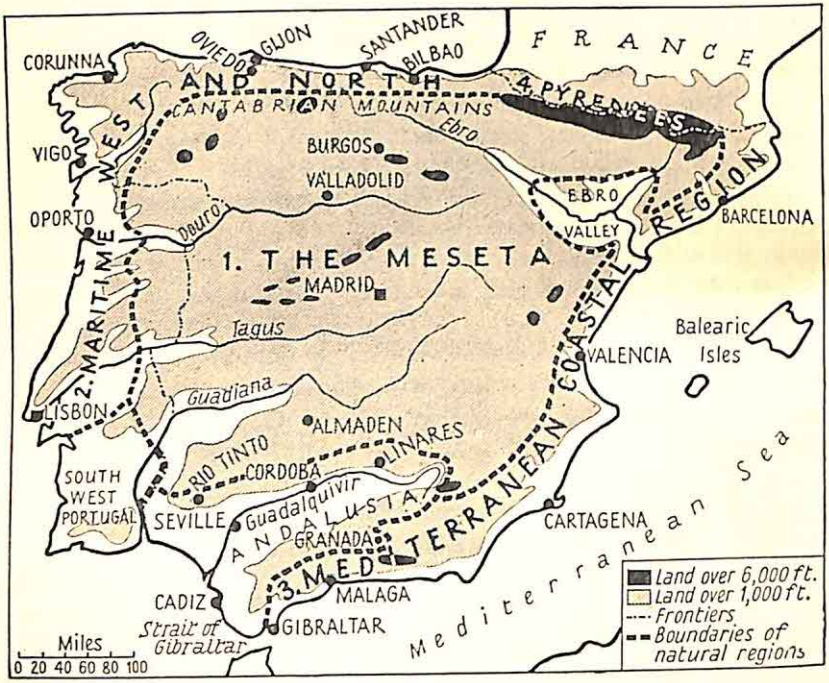


FIG. 157. Iberian Peninsula: Natural Regions.

range and two railways also cross it. The Peninsula is divided politically into Spain, about the same size as Germany, with a population of 24 millions; and Portugal, somewhat larger than Ireland, with 6½ million inhabitants. The core of the Iberian Peninsula is an ancient crust-block, the Meseta, which has an average elevation of from 2,000 to 3,000 feet. It is bounded on the north by the Pyrenees and their continuation, the Cantabrians; and on the south by the Sierra Morena, which rise abruptly from the Plain of Andalusia.

The Meseta is crossed from west to east by *sierras*,[1] saw-toothed ridges which, rising a few thousand feet above the general level, hinder communications between north and south. From the Meseta the Ebro flows south-east to the Mediterranean, and the Douro, Tagus, Guadiana, and Guadalquivir to the Atlantic. In their plateau courses the rivers speed through gorges so deep that their waters are useless either for navigation or irrigation; though recently some of the falls have been harnessed for electricity. The ancient (Archean) rocks are rich in minerals, notably silver, lead, quicksilver, and copper.

We may divide the Iberian Peninsula into four Natural Regions: (1) the Meseta, (2) the Mediterranean South and South-East, (3) the Maritime North and North-West, and (4) the Pyrenees.

SPAIN

(1) **The Meseta.** The high edge of the Meseta prevents rain-bearing winds from reaching the interior, which has a continental climate, with hot summers, cold winters, and a scanty rainfall. The plateau is almost treeless and in some districts is little better than a desert. The cold winters prevent the cultivation of Mediterranean products like the olives. Wheat is grown on the lower slopes of the Cantabrians and on irrigated lands round Valladolid. Many sheep and goats graze on the poor pastures. It was from Spain that merino sheep were exported to Australia to form the foundation of many flocks there. Local wool is made into cloth at Burgos, an ancient city and focal point in the Douro basin. In the south, copper, mined at *Rio Tinto*, is exported from Huelva; Almaden has valuable quicksilver mines; silver and lead are obtained from Linares. *Madrid* (1,000,000) was chosen to be the capital of Spain because of its central position, which later made it a focus of railways. A study of the railway system emphasizes the difficult topography of the country. Partly owing to this, but even more to the relative poverty of Spain increased by internal disunion, the railway mileage is little more than one-third that of France.

(2) **The South and South-East** have a Mediterranean climate, but the winter rainfall is small, especially along the east coast, lying in the lee of the rain-bringing westerlies. In *Andalusia*, which opens to the Atlantic, it is somewhat greater. This rich lowland, forming

[1] *sierra* = a saw.

a wedge between the Sierra Morena and the Sierra Nevada, is drained by the Guadalquivir. Oranges, of the bitter type used for marmalade, are widely grown, being exported from *Seville*, a river port some 75 miles up the Guadalquivir. Vines are extensively cultivated. The district round Jerez is noted for its sherry, which is shipped from *Cadiz*. Andalusia is the chief olive-oil producing region in Spain. The trees are grown on the terraced slopes of the Sierra Morena and the Sierra Nevada, where groves are found as high as 3,000 feet round Grenada, the last stronghold of the Moors. From the south-west of Andalusia forests of evergreen cork extend across the frontier into Southern Portugal.

(3) Along the **South-East Coastlands** maize, cotton, sugar-cane, rice, and even bananas are grown on irrigated lowlands, while vines and olives flourish on the lower slopes of the hills. So hot are the summers that dates ripen round Elche, on the railway from Alicante inland to Murcia. Raisins are exported from *Malaga*, other fruit-exporting ports being Cartagena and *Valencia*.

Barcelona (1,150,000), the capital of Catalonia, is the chief port and commercial centre and largest town in Spain. Power for its cotton factories is generated from the waters of the Segre (a tributary of the Ebro) and from other streams descending from the Pyrenees. From Barcelona a line crosses to the Ebro valley, which it follows to Saragossa, the chief town of Aragon, and thence to San Sebastian, on the Bay of Biscay. Barcelona is the port for the *Balearic Islands*, of which the largest is Majorca, whose capital is Palma.

(3) **North and North-West Spain.** This maritime and well watered region, lying between the Cantabrians and the Bay of Biscay, presents a striking contrast to the rest of Spain. Beech, oak, chestnut, and pine woods clothe the rain-drenched slopes of the mountains; on the lowlands wheat, roots, and fruits are grown; and cattle graze in the lush meadows.

Northern Spain is rich in *iron ore*. As the mines lie close to the coast the ore can be exported cheaply by water from *Bilbao*, *Santander*, and *Gijon*. *Coal*, mined round *Oviedo*, is used for local iron industries and in the chemical and glass works of Bilbao. There are sardine fisheries, for which *Corunna* and *Vigo*, on the west coast, are the leading centres.

(4) **The Pyrenees** have already been described (see p. 189)

PORTUGAL

On the west the Meseta slopes to a wide plain across which the Minho, Douro, and Tagus flow into the Atlantic. South of the Minho this western portion of the Iberian Peninsula forms Portugal. We may divide the country into two natural regions each of which forms part of the corresponding climatic and adjacent region in Spain. (1) Northern Portugal has a maritime climate; while (2) Southern Portugal, with its Mediterranean climate and products, resembles Southern Spain.

(1) **In Northern Portugal** forests of beech, walnut, and pine clothe the windward slopes of the mountains, while vines are cultivated in the less exposed valleys. Some 60 miles up the Douro valley are the famous vineyards whose grapes are made into *port*, exported from *Oporto* (230,000), a few miles from the open sea.

(2) **In Southern Portugal** olives, oranges, and vines are grown, but much wealth is derived from the forests of evergreen oak, from the bark of whose trees cork, the third leading export of the country, is obtained. *Lisbon*, the port-capital, is the European terminal of the Atlantic Air Route from New York, via the Azores. It is the only manufacturing city in the country, making textiles, 'finishing' cork, and tinning sardines. But the chief centre of the sardine industry, which after wine making is the most important industry in Portugal, is Setubal, a port some 10 miles south of Lisbon.

Portugal still retains considerable overseas possessions. In the Atlantic she owns the *Azores* and the *Madeira Islands*, both of which are regarded as an integral part of the republic, as well as the *Cape Verde Islands*. To these must be added her extensive possessions on the mainland of Africa, and her territories in China, the East Indies, and India. These lands not only supply her with raw materials such as coffee, sugar, and cotton, but form a market for her textile and other manufactured goods.

GIBRALTAR

The rock of Gibraltar, a British Crown Colony, has an area of nearly 2 square miles. It owes its strategic importance as a naval base

to its position on the eastern side of the Strait of Gibraltar, leading from the Atlantic to the Mediterranean Sea.

EXERCISES

1. Draw a sketch-map of the Iberian Peninsula and on it indicate the chief natural regions. Describe the climate, characteristic products, and occupations of *one* of the more important regions.

2. What geographical factors have determined the site and contributed to the growth of each of the following: Madrid, Barcelona, Valencia, and Lisbon? Illustrate your answer by sketch-maps.

3. Spain possesses valuable minerals. Name the chief minerals, stating the areas from which they are obtained, and through what ports they are exported. Give a map.

ITALY

Though only two-thirds the size of Spain, Italy has almost twice as many inhabitants. She is advantageously placed, for she commands seaways leading from the Western to the Eastern Basin of the Mediterranean, and land routes, by way of the Alpine passes, to Central and Western Europe. The parallel ranges of the Apennines run for 800 miles through the entire length of the Italian Peninsula. Diverging from the Alps at the Altare Pass, north of Savona, they form the southern margin of the North Italian Plain, thus shutting it off from Peninsular Italy. Little more than half the land is suitable for cultivation, yet 70 per cent. of the people are engaged in agriculture.

The three main regions are: (1) the North Italian Plain and Alpine Italy, (2) Peninsular Italy, and (3) Insular Italy.

(1) **The North Italian Plain and Alpine Italy.** The North Italian Plain, lying between the Alps and the Apennines, is a depression, once an arm of the Adriatic, which has been filled up by waste brought down from the Alps by the Po and its tributaries. The Alpine streams, fed by heavy rains and swollen in spring and summer by melting snows, unlike those descending from the Apennines, have a constant flow throughout the year and thus supply water both for irrigation and hydro-electric power. Because of the great amount of sediment it carries, the Po is steadily raising its bed and in its lower course actually flows at a higher level than the surrounding land. This facilitates irrigation, but as it makes the river liable to flooding few towns are built on its banks.

Of the streams descending from the Alps the Ticino drains Lake

Maggiore, the Adda Lake Como, and the Mincio Lake Garda—long, narrow, mountain lakes, formed by the damming up of the lower ends of the valleys by morainic material. These southward-facing valleys of *Alpine Italy*, owing to their aspect and sheltered position, have a much milder climate than the Po lowlands. Thus the vine, the olive, and in specially favoured districts, as round Lake

FIG. 158. Italy: Natural Regions.

Garda, the orange can be cultivated. Such valleys are usually well wooded with sweet chestnuts on the lower slopes and pines at higher elevations.

On the other hand, the *Northern Plain* itself, shut off from the influence of the Mediterranean by the Apennines, has a continental climate. The summers are as hot as those of Southern Italy, but the winters are much colder. Rain falls throughout the year, being heaviest in early summer and autumn. In the south are stretches of meadow land on which are reared many cattle whose milk is made into cheese, such as gorgonzola. Wheat and maize are grown, and the sun-baked villages are surrounded by vineyards and rows of clipped mulberry trees, whose leaves are used to feed silkworms

which provide silk for factories at Milan and Como. So hot are the summers that rice can be grown on irrigated lands, but the winters are too cold for olives, which cannot stand prolonged frosts.

Most of the chief towns lie either at the entrances to valleys which lead up to passes across the Alps, or at the base of the Apennines. *Turin* (620,000), standing on the upper Po, where the river is not yet too great in volume to be controlled in time of flood, commands the Mont Cenis route leading to the Rhone valley. Mountain streams provide hydro-electric power for its textile factories and motor-car works. *Milan* (1,103,000), the second largest and leading industrial city in Italy, is situated where routes by way of the Simplon and St. Gotthard passes reach the plain. It has cotton, silk, cutlery, and motor-tyre factories, as well as railway works. Owing to the great development of hydro-electric power, especially in the Alpine region, Italy now has the greatest mileage of electrified railways of any country in the world. Verona, on the Adige, commands the Brenner route to Southern Germany. *Venice*, built on a number of small islands in the Adriatic and protected on her landward side by marshes, was one of the leading maritime republics of the Middle Ages. Her importance declined with the discovery of America and the shifting of trade routes to the Atlantic, and the opening of the Suez Canal did little to restore her prosperity. To-day she is mainly noted as a pleasure resort, and as a port ranks far behind Trieste (see p. 252). Her industries include glass-making and the manufacture of artistic goods.

FIG. 159. Sites of Milan, Turin, and Genoa.

Situated at the foot of the Apennines and built on firm ground above the marshes of the plain are a number of ancient cities. Among them are Alessandria, a railway junction, whence a low pass over the Apennines leads to Genoa; Parma, Modena, and Bologna, the last commanding a pass across the mountains to Florence.

(2) Peninsular Italy. The Apennines form the backbone of Peninsular Italy. Around the Gulf of Genoa they rise steeply from the sea, but farther south they recede, leaving the plain of Tuscany, drained by the Arno; Latium, crossed by the Tiber; and the Campania round Naples. From Ancona southward the Apennines run close to the Adriatic and, except in the lowland of Apulia, the coastal plain is narrow and sometimes absent. Apart from Brindisi the east coast has no good harbours, while few easy routes lead inland. The west coast, with a number of good harbours and valleys leading to the interior, has throughout historic times been more important.

The climate and products of Peninsular Italy are typical of the Mediterranean Lands. There is little pasture suited for cattle, but many sheep and goats are reared, feeding in summer on the upland herbage and returning in winter to the lowlands. Wheat, which occupies one-third of the arable land in Italy, is widely cultivated round Naples; on the plain of Apulia, which produces a particularly hard kind used for making macaroni; and on the recently reclaimed lands of the Pontine marshes, south of Rome. Vines for wine and olives for oil are much grown; the hill-sides of the Arno valley being famed for the latter crop. Artificial watering is necessary for vegetables, which in some districts are planted between the trees in orchards, vineyards, and olive groves, and in others are grown in market gardens.

Genoa (625,000), commanding several easy passes over the Apennines into Piedmont and Lombardy, is the chief outlet for the Northern Plain. From Genoa the electrified railway to Southern Italy runs along the foot of the mountains, through many tunnels, past Carrara, noted for its marble, to Pisa, at the mouth of the Arno, which, owing to the silting up of the river, has yielded its position as a port to Leghorn, to the south. From Pisa the southward route continues along the coast to Rome; eastward the railway traverses up the valley of the Arno to *Florence*, a bridge town built where the river leaves the mountains and enters the plain. From Florence the railway to Rome continues up the valley of the Arno and then down that of the Tiber. *Rome* (1,150,000), the capital and largest town in Italy, was built on low but steep hills on the left bank of the Tiber, to which point the river was navigable for small boats, and where an island in the stream made it possible for it to be bridged. Its importance is, however, mainly due to historical and religious causes.

Within Rome lies the *Vatican City*, an independent state ruled by the Pope. From Rome the railway continues to *Naples* (860,000), the third largest city in Italy, picturesquely placed on a magnificent bay dominated by the active volcano of Vesuvius. An important port, it manufactures olive oil, soap, flour, macaroni, and textiles. Still following the coast the line runs past many villages, shut in between the mountains and the sea, whose people are engaged in the sardine, tunny, and anchovy fisheries of the Tyrrhenian Sea. Reggio stands on the narrow Strait of Messina, opposite the town of Messina in Sicily. The strait was formed by an exceptionally deep-seated fracture of the earth's crust, which accounts for the severe earthquakes in this area, such as that which in 1908 entirely destroyed Messina and Reggio; both have since been rebuilt.

(3) **Insular Italy.** Of the Italian islands in the western basin of the Mediterranean by far the most important is *Sicily*, dominated by Etna, the volcano which rises to 10,800 feet and which is nearly 100 miles in circuit at its base. Somewhat larger than Wales, Sicily is one of the most densely peopled portions of Italy. Its crops resemble those of the Peninsula. Sulphur is shipped from Catania, at the base of Etna. *Palermo* (408,000), the capital, exports the olive oil, oranges, and lemons for which the island is noted. Owing to its position athwart the seaway leading from the Western to the Eastern basin of the Mediterranean, Sicily has been from early times of great strategical importance. The *Lipari Islands*, with the volcanic cone of Stromboli, lie to the north-west of Sicily. *Pantelleria* is a fortified island midway between Sicily and Tunisia.

Sardinia, a mountainous and thinly peopled island, about the same size as Sicily, is separated from the French island of Corsica by the Strait of Bonifacio. Its capital is the port Cagliari, on the south. Much of Sardinia is covered with poor forest and evergreen scrub (*maquis*). Apart from its potential strategic importance, its chief value to Italy—a country poor in minerals—lies in its lead and zinc mines. *Elba*, an island off the coast of Tuscany, produces *iron* ore.

Trieste. In 1946 Trieste was constituted an international port under the Security Council of the United Nations Organization (U.N.O.). Standing at the head of the Adriatic, it is one of the main outlets for Yugoslavia, north-east Italy, and much of Central Europe, having direct rail communication with Belgrade, Budapest, and Vienna.

FIG. 160. Routes and towns of Italy.

FOREIGN TRADE OF ITALY			
EXPORTS		IMPORTS	
Fruits, Vegetables, Cereals		Minerals	
Silk and Artificial Silk		Cotton	
Motor Cars etc.		Iron and Steel	
Cheese Products		Cereals etc.	

FIG. 160 (a).

Malta. Some 60 miles south of Sicily lie the British islands of Malta and Gozo, which together cover an area about three-quarters that of the Isle of Wight. Farming is the chief occupation. Valletta, the capital, stands on a fine harbour. The commanding situation of Malta, between Sicily and Tripoli, and midway on the route from Gibraltar to the Suez Canal, has made the island the chief British naval and air base in the Mediterranean.

ALBANIA

This small highland state lies on the east of the Adriatic. Most of the country is a rugged region forming the southern portion of the Dinaric Alps, which here recede somewhat from the sea. Along the Adriatic littoral Mediterranean products are grown. The highlands are mainly pastoral. Hardy crops are cultivated round the isolated villages, where each family grows enough for its own needs and rears a few animals for meat, milk, and wool. A railway runs from Durres (Durazzo), the one modern port, to *Tirana*, the capital.

EXERCISES

1. Select two important inland towns and two of the chief sea-ports in Italy. Illustrating your answer by sketch-maps, describe the situation of each, and discuss the geographical causes that have contributed to their growth.

2. Draw a sketch-map of Italy and on it indicate the major natural regions. Contrast the two major regions with respect to climate, and the resulting types of farming.

3. Describe a railway journey from Naples to Venice, so as to bring out clearly the contrasting types of country that you would see. Use your atlas.

GREECE

Of the three mountainous peninsulas stretching southward into the Mediterranean, the most easterly one, together with *Crete* and numerous islands in the Aegean and Ionian Seas, forms Greece. This state, about the size of England, has, like that country, had an influence on the history of the world altogether out of proportion to its size.

The sinking of the earth's crust in this part of the Eastern Mediterranean allowed the sea to cover the less elevated portions, leaving the peaks as islands and converting the lower ends of the valleys into bays. In such valleys, often separated by barren uplands from their neighbours but linked by sea, rose up the Greek City States, whose

colonies spread throughout the Mediterranean, and whose ideals played so great a part in shaping Western Civilization.

Four-fifths of Greece is mountainous. As the rivers usually flow in deep gorges they are of little use for irrigation. In most parts the climate is dry, though the western coasts and the Ionian Islands, which in winter face the prevailing westerly winds, receive a considerable rainfall. (Compare Corfu, 50 inches a year, with Athens, only 15 inches.) Iron is the chief mineral. Greece is primarily an

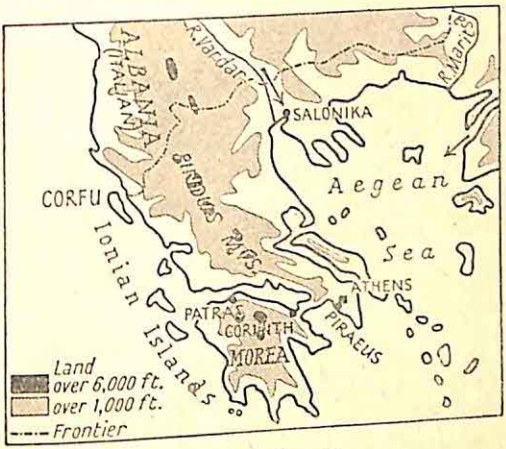


FIG. 161. Greece.

agricultural country, but of the total area only one-fifth is suitable for cultivation. Wheat is the chief cereal, while lemons, oranges, figs, and tobacco are grown, and olives and vines cultivated on terraced hill-sides. The district along the northern shores of the Gulf of Corinth, the western and southern coasts of the Morea Peninsula, and the Ionian Islands of Zante and Cephalonia are famous for their currants, which are exported from Patras. *Athens* (392,000), the capital, standing at the base of the historic Acropolis, lies some five miles from Piraeus, its port.

Mulberries, cotton, and tobacco are grown on the plain of Eastern Greece, which stretches from the slopes of the Rhodope Mountains to the Aegean. *Salonika* (237,000), the chief port of Greece, commands the Vardar-Morava route, followed by the railway to Belgrade, on the Danube.

EUROPEAN TURKEY

All that remains of the once great Turkish Empire in Europe is the region stretching from the Sea of Marmara and the Black Sea westward to Edirne (Adrianople), well placed on a defensive site at the confluence of the Maritsa and one of its tributaries. But though the seat of the government of the Turkish Republic has been trans-

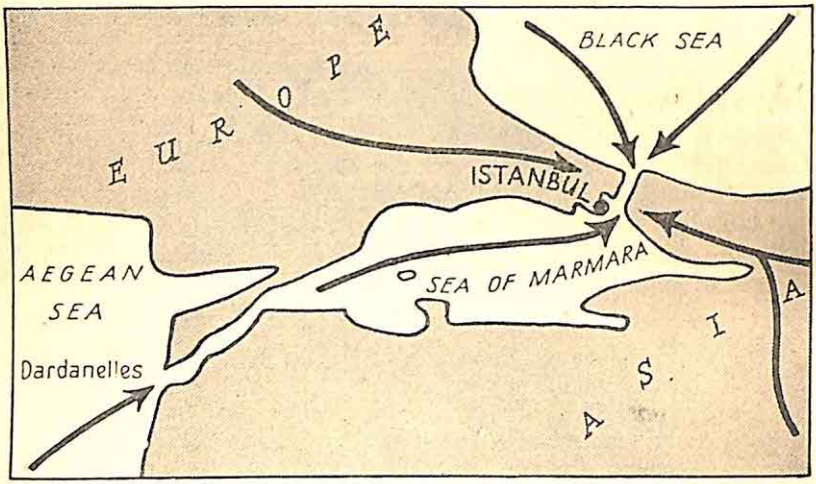


FIG. 162. The site of Istanbul (Constantinople).

ferred to Ankara, *Istanbul* (Constantinople) still remains by far the largest city in Turkey. Wonderfully situated on the Golden Horn, an arm of the Bosporus, and commanding the route across that strait from Europe to Asia Minor, as well as the seaway through it leading from the Aegean and Sea of Marmara to the Black Sea, it has from early times been a place of great strategic and commercial importance.

EXERCISES

1. Show how the geographical conditions have influenced occupations in Greece.

2. Describe, with the aid of sketch-maps, the importance of the position of (*a*) Salonika and (*b*) Istanbul. Can you suggest any reasons why the Turks transferred their capital to Ankara, in Asiatic Turkey?

3. Compare the western and eastern coasts of the Adriatic, and state in what respects they are similar and in what respects they differ from each other. Discuss each coast in its relation to human settlement.

PART III

ASIA

CHAPTER XVII

GENERAL SURVEY OF ASIA

POSITION AND SIZE

Asia, the largest continent, occupies one-third of the land surface of the globe. It extends from 26° E. to 170° E. and from within 12° of the North Pole to within 1° of the Equator, or including the Malay Archipelago to 10° S. Thus the mainland lies wholly within the Northern Hemisphere. From Europe, Asia stretches eastward to the Pacific; from the Arctic south to the Indian Ocean, into which project the peninsulas of Arabia, India, and Indo-China. With the exception of New Guinea and the Aru Islands, which belong to Australia, the islands of the East Indies are regarded as part of Asia. This division between Asia and Australia is based on a line of fold mountains which can be traced from the Malay Peninsula through Sumatra and Java to the Philippines. Formerly Wallace's line, depending on differences of flora and fauna, was regarded as the boundary between the two continents.

Though Asia is margined on three sides by oceans it has, in proportion to its size, few indentations. Over one-third of the continent, or an area one and a half times the size of Europe, is more than 600 miles from the sea.

STRUCTURE, RELIEF, AND DRAINAGE

We can divide Asia into six major physical divisions: (1) the Central Fold Mountains and Intermont Plateaux; (2) the Eastern Volcanic Islands; (3) the North-East Highlands; (4) the Southern Tablelands; (5) the Alluvial Plains of South-East Asia; and (6) the Northern Plain.

(1) **The Central Fold Mountains and Plateaux**, part of the Mid-World Mountain System which stretches from Europe to the Pacific, form a barrier to climatic influences and communications between the south-east of Asia and the north-west. The arrangement

of the system is best grasped if we remember that (*a*) the ranges radiate from two great mountain knots—the Pamir Plateau and the Armenian Knot, and (*b*) that they enclose huge and lofty plateaux, which have a scanty rainfall and form regions of inland drainage.

FIG. 163. Asia: Relief and Drainage.

Starting in the west, note, on Fig. 163, the position of the ranges and plateaux.

(*a*) The Armenian Knot is separated from the Caucasus Mountains by the Kur rift valley.

(*b*) From the Armenian Knot the Pontic Mountains run west, and the Anti-Taurus and Taurus south-west to enclose the Plateau of Asia Minor.

(*c*) The *Plateau of Iran* is shut in by fold mountains. From the Armenian Knot one line runs from the Elburz Mountains through the Hindu Kush to the Pamirs. Another line forms a southerly loop round Iran. Trace it from the Armenian Knot through the Kurdistan Highlands and thence along the southern margin of the Plateau and finally north-east through the Sulaiman Mountains to the Pamirs.

(*d*) From the Pamirs the Tien Shan run north-east and the Kunlun east to enclose the Tarim Basin.

(*e*) The *Plateau of Tibet*, standing at a height of from 14,000 to 17,000 feet above sea-level, is margined by the Kunlun Mountains and the *Himalayas*.

(*f*) From the eastern end of the Himalayas great fold ranges (deflected by the Plateau of Yunnan) run south through Burma as the Arakan Yoma and Pegu Yoma. Thence they may be traced (i) through the Andaman and Nicobar Islands, Sumatra, and Java; (ii) by the Malay Range, the backbone of the Malay Peninsula; and (iii) through the Annam Range running between the Mekong valley and the South China Sea.

(2) **The Eastern Volcanic Islands,** stretching from the Malay Archipelago through the Philippines, Taiwan (Formosa), and Japan to the Kamchatka Peninsula, are the unsubmerged portions of a bold mountain range. The higher portions form islands separated from the mainland by a series of seas.

(3) **The North-East Highlands,** running from the Central Fold Mountains and Plateaux to the extreme north-east of Asia, are very ancient and much denuded uplands. The *Altai* and *Sayan Mountains* are separated by Lake Baikal from the *Yablonoi Mountains* in which the Amur (2,500 miles) rises. Notice how the *Mongolian Plateau* is shut in by the *Altai* and *Sayan Mountains* on the north, the *Tien Shan* on the south, and the *Khingan Mountains* and *Shansi Highlands* on the east.

(4) **The Southern Tablelands** of Arabia and Peninsular India are crust-blocks. Like most structural areas of this type they are difficult of access.

(5) **The Alluvial Plains** of South-East Asia include the Mesopotamian Lowland built up of sediment brought down by the Tigris (1,100 miles) and the Euphrates (1,700 miles); and the Indo-Gangetic Plain, or the Plain of Hindustan, composed of alluvium deposited by the Indus (1,800 miles), the Ganges (1,500 miles), the Brahmaputra

(1,800 miles), and their tributaries. Other important alluvial plains include the lower basins of the Irrawaddy, the Salween, the Menam, the Mekong, the Yangtze-kiang (3,400 miles), and the Hwang-ho (2,500 miles).

(6) **The Northern Lowlands**, an extension of the Great European Plain, is broadest in the west. It may be divided into two portions: (i) the *Siberian Plain*, drained to the Arctic by the Lena (2,500 miles), the Yenesei (3,200 miles), and the Ob (2,800 miles); and (ii) *Turan*, forming the south-west portion of the lowland, which is drained partly to the Caspian, but mainly to the Sea of Aral, into which flow the Amu Daria (1,300 miles) and the Syr Daria (1,100 miles). Turan forms part of the huge inland drainage area of Central Asia.

CLIMATE

The enormous size, compactness, range of latitude, and relief of Asia combine to produce great climatic contrasts. As most of the continent lies far from the sea a considerable area has a continental climate, with extremes of heat and cold. The great central mountain system acts as a barrier both to cold influences from the north, and to warm influences and rain-bearing winds from the south; while the elevation of this and other areas further accentuates climatic differences. By far the most striking feature about the climate of Asia is the monsoons. The summer monsoon winds, flowing in from the Indian and Pacific Oceans, which cause heavy rains to fall over South-East Asia during the hottest and most productive part of the year, are the main reason for the abounding fertility and dense population of the great alluvial plains of this part of Asia.

Temperature. Broadly speaking, *January* temperatures decrease from south to north (Fig. 164). The general direction of the January isotherms is from east to west, though their northward bend along both the Pacific and Mediterranean coasts shows the moderating effect of the sea in these regions. Winter temperatures far below freezing-point are found over the whole of Central and Northern Asia. Nearly the whole of Siberia has a January temperature below zero. Verkhoyansk, just within the Arctic circle, the coldest place in the world, has a January temperature of −58·9° F.

In *July* temperatures also show a general decrease from south to north, though the cooling influence of the Pacific on the coastal areas is shown by the southern bend of the isotherms in that region (Fig.

165). For a similar reason Malaya and the East Indies are somewhat cooler than Arabia, Iran, and Northern India, which lie farther north. In July Central Siberia is slightly warmer than Southern England, but the Arctic coast is cool.

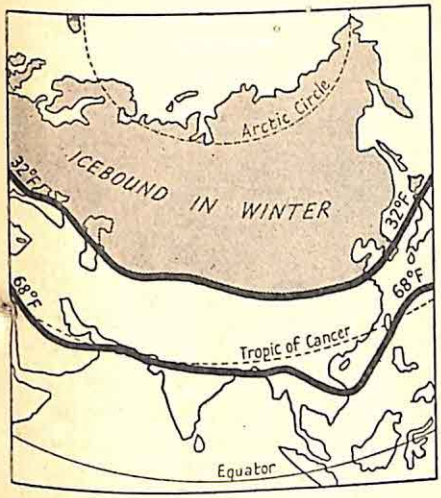


FIG. 164. Asia: Winter (January) Temperature.

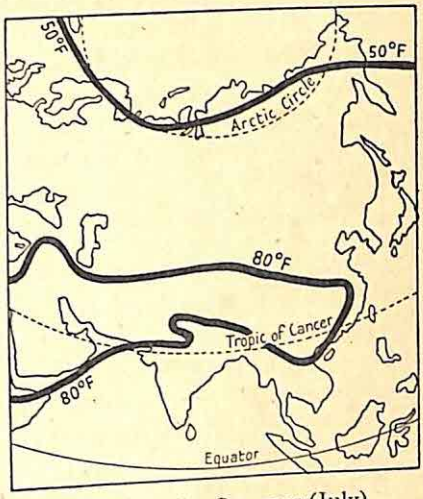


FIG. 165. Asia: Summer (July) Temperature.

Winds and Rainfall. (1) Though the Monsoon Climate is most marked in India, the whole of south-east Asia belongs to this climatic régime. The marked pressure changes from winter to summer over Central Asia cause remarkable seasonal changes of winds. In *winter*, owing to the intense cold, a region of high pressure, with outflowing winds, is found over Central Asia. The centre of this system is over the Gobi Desert, but it extends far to the north. The air over the ocean is relatively warm, for it has been absorbing heat during the summer, and so cold heavy air flows from the high pressure belt towards the regions of lower pressure over the Pacific.

But as the plains of Northern India are cut off by the enormous barrier of the Himalayas from Central Asia, the high pressure area in the latter region is not responsible for the winter monsoons of India. In winter the Indus basin is an area of high pressure from which winds blow gently outwards down the river valleys towards

the ocean. These winds are not exceptionally cold, and even in Northern India the winters are less severe than in Central and Northern China. The general direction of the winter monsoon winds is from the north-north-west in China, and the north-north-east in India. As they blow from land to sea they are

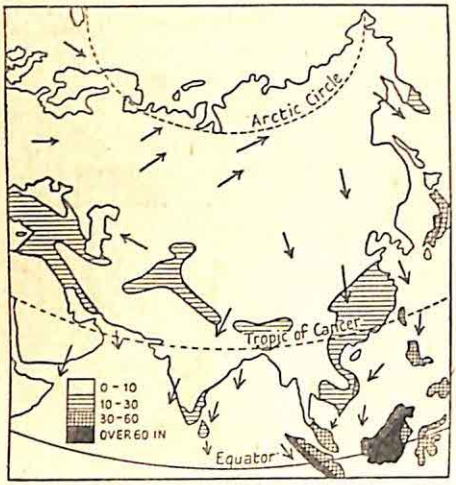


FIG. 166. Asia: Rainfall and winds, November to April.

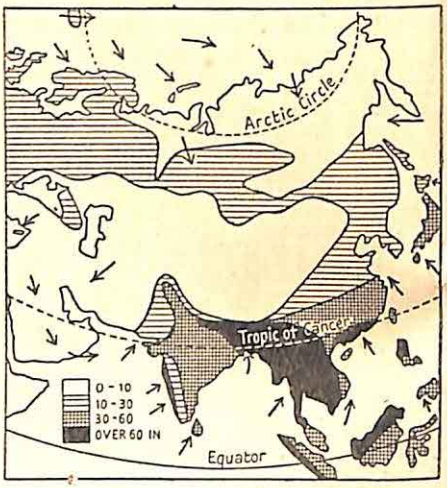


FIG. 167. Asia: Rainfall and winds, May to October.

dry winds, except in areas like the east coast of Annam, South-East India, and Ceylon, where they reach the land after crossing an expanse of ocean.

In *summer* conditions are reversed. The land heats much more rapidly than the sea and becomes a region of *low pressure* with *inflowing winds*. The centre of this low pressure system lies just north of the Tropic of Cancer over Baluchistan and Sind. From this area the depression extends westward to Arabia, and north-eastward over the continent. In India, the moisture-laden winds from the Indian Ocean blow from the south-west. In China, south-east winds blow from the Pacific. These inflowing winds bring to South-East Asia copious rains, which are especially heavy on the windward slopes of the mountains (Figs. 166, 167).

The *essential feature of the monsoon climate* which is most marked in Asia is the *seasonal change of wind*. Generally speaking, winters are

dry and summers wet. It should, however, be clearly understood that *temperature conditions do not, of necessity, form part of the definition.* For example, the following towns all have a monsoon climate with hot rainy summers and dry winters; but the January temperature at Calcutta is 65° F., at Penang 80° F., and at Peiping 24° F. (Fig. 168). We must, therefore, distinguish between:

(*a*) The *tropical monsoon climate* of India, Indo-China, and Southern China.

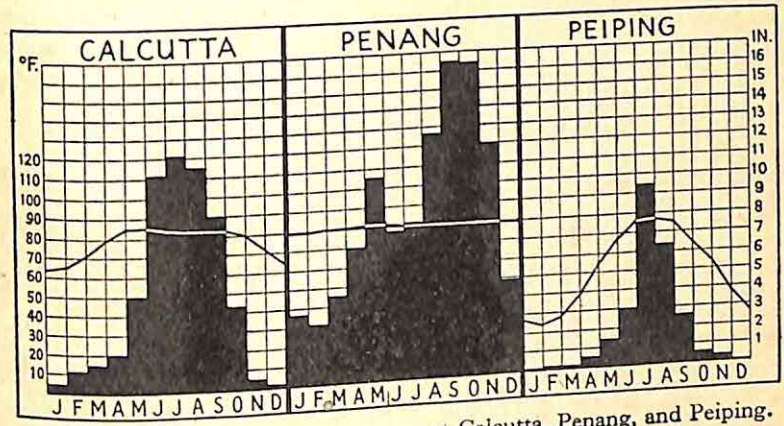


FIG. 168. Rainfall and Temperature at Calcutta, Penang, and Peiping.

(*b*) The *monsoon climate* of the Malay Peninsula and the Malay Archipelago, where the typical monsoon régime is modified both by latitude and maritime situation. In this region temperatures are uniformly high. Rain falls at all seasons, but in most areas the rainiest months are from May to October, while December and January are relatively dry. (Compare with India.)

(*c*) The *temperate monsoon climate* of North-East Asia, which includes Central and Northern China, Manchukuo, and Central and Southern Japan.

(2) North-west of the Monsoon Region a *desert and arid belt* stretches from Arabia, through Iran and Turkestan, into Mongolia. The annual rainfall is under 10 inches and irrigation is essential for cultivation. The lack of rain is due to several causes. Arabia and the southern part of the Plateau of Iran receive little rain because they lie in the trade wind desert belt. The Plateau of Mongolia is

dry partly because (1) it lies so far from the sea, and (2) marginal mountains increase the aridity of the climate.

(3) On the north-west the desert and arid belt merges into the *Mediterranean Lands* (Asia Minor, Syria, and Palestine), with hot dry summers and mild showery winters. The influence of the Mediterranean extends into Mesopotamia and the Plateau of Iran, though summers grow hotter, winters colder, and winter rainfall slighter with increasing distance from this sea.

(4) The rainfall in the *Cool Temperate Lowlands* of the Northern Plain (Siberia) varies from 10 inches in the south (on the desert margin) to 25 inches in the north. Most of the rain falls in thunder showers in the summer months, when low pressures over the interior allow cyclonic storms to travel inland. In winter precipitation is in the form of snow. The *Arctic Coast Lands* have a low rainfall, as owing to their low temperatures there is little evaporation and the atmosphere is dry.

NATURAL VEGETATION AND CROPS

The effect of climate and relief is well illustrated by the vegetation. In the north the period of active plant growth is limited to three months: in the south-east it is continuous throughout the year. Irrigation is necessary for cultivation in the Desert Lands owing to lack of rain; and in the Monsoon and Mediterranean lands owing to its seasonal nature (Fig. 169).

The Tundra stretches along the northern shores of the continent.

The Coniferous Forest Belt, or *Taiga*, to the south of the Tundra, extends from the north of Europe across northern Asia to the Pacific. The chief trees include spruce, silver-birch, larch, and pine.

Deciduous Forests of broad-leafed trees, such as oak, beech, and camphor, lie to the south-east of the Coniferous Forest Belt.

The Steppes which are found to the south-west of the Coniferous Forests extend southward towards the Caspian, and through Europe to the Black Sea. The rainfall is sufficient for grass, and in the wetter areas for wheat, but except in favoured districts, such as river valleys, it is insufficient for trees.

In the *Mediterranean Zone* plants are adapted to withstand the summer drought (see above).

The Desert Belt is fertile where it can be irrigated. The steppe margins, e.g. Turan, are the home of nomadic herdsmen.

The vegetation of the *Mountain Belt* of Central Asia varies with the elevation, ranging from monsoon forests to perpetual snow above 16,000 or 17,000 feet.

The *Monsoon Lands* are the most productive parts of Asia. In

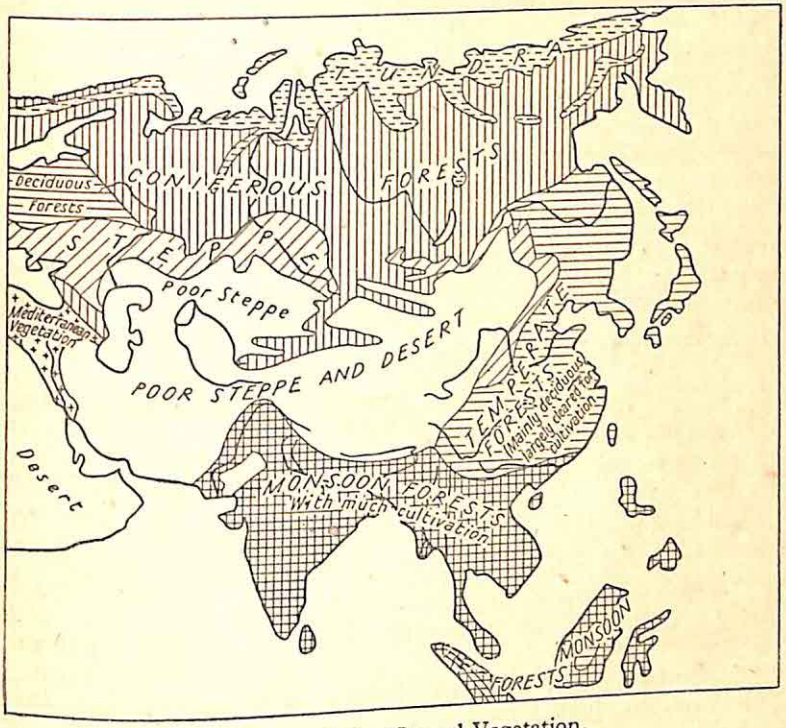


FIG. 169. Asia: Natural Vegetation.

many parts are forests and jungles, but they are more open than the tropical forests, and most of the trees shed their leaves in the dry season. Teak and bamboos are important. In areas with less rain are wooded grasslands that resemble the savannas of South America. Rice, millet, cotton, sugar-cane, tea, and rubber are the chief cultivated crops.

In the *Equatorial Monsoon Forests* of Malaya and the East Indies trees grow more closely together than they do in the monsoon forests of India, but many of the products are similar to those of the monsoon region proper. Rubber is the leading commercial crop.

NATURAL REGIONS

We may divide Asia into four major Natural Regions based mainly on climatic characteristics which, as we have seen, are greatly influenced by the relief and especially by the central mountain barrier.

(1) *The Monsoon Lands* of the South-East include India, Indo-

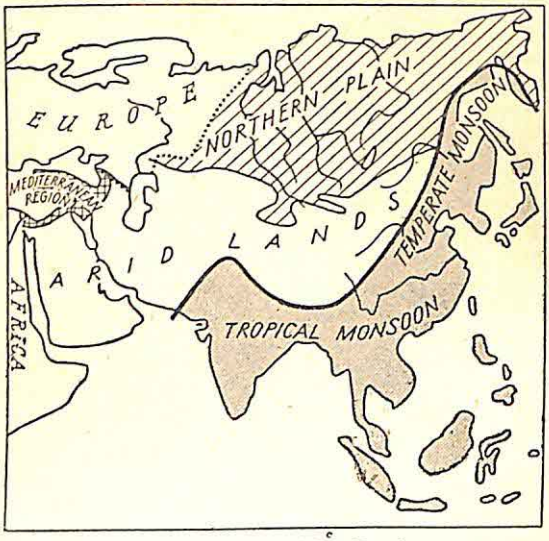


FIG. 170. Asia: Major Regions.

China, Malaya, the Malay Archipelago, China, Manchukuo, and Central and Southern Japan.

(2) *The Mediterranean Lands* comprise Turkey (Asia Minor), Syria, Palestine, and Trans-Jordan.

(3) *The Arid Lands* may be divided into (*a*) those of the *South-West* consisting of Arabia, Iraq, Iran (Persia), and Afghanistan; and (*b*) *Central Asia* including Chinese Central Asia and Soviet Central Asia.

(4) *The Northern Plain* and the *Arctic Coastlands.*

EXERCISES

1. Illustrating your answer by a sketch-map, describe the Central Mountain System of Asia.

2. Give an account of the structure and relief of the coast lands and islands of Eastern Asia. Show how they have facilitated communications by sea in this area.

3. Draw a sketch-map of Asia. Shade the high land, and on your map insert and name the Ob, Yenisei, Lena, Amur, Hwang-ho, Yangtze-kiang, Mekong, Menam, Salween, Irrawaddy, Ganges, Brahmaputra, Indus, Tigris, and Euphrates.

4. (*a*) What do you understand by a region of *inland drainage*? (*b*) Show by means of a sketch-map the Inland Drainage Area of Asia including the Caspian region. (*c*) Give examples of similar areas in other parts of the world.

5. What do you understand by a monsoon climate? Divide the monsoon region of Asia into three climatic divisions and give reasons for your divisions. Show by a sketch-map the direction of the winds over South-East Asia during the summer monsoon. Name two other regions, outside Asia, which have a monsoon climate.

6. On a sketch-map of Asia mark and name the chief Natural Vegetation Belts. Describe and account for the vegetation in any *two* of them.

7. What do you mean by a *Natural Region*? Divide Asia into *major* Natural Regions, stating briefly the reasons for your divisions. Which region do you consider the most important, and why?

CHAPTER XVIII

THE MONSOON LANDS

INDIA

INDIA has been aptly termed a sub-continent, for lofty mountains separate it from the rest of Asia, its size is enormous, its relief and climate varied, and its people differ in race, religion, and language. These differences help to account for the fact that India has never been united under the rule of its own people, but never has the feeling of unity been so strong as it is to-day. This is due mainly to the extension of British authority over the whole country which also made possible the building of railways and roads, and the construction of large-scale irrigation works.

Government. India is divided into a number of *British Provinces* and *Indian States*. Since 1937 most of the former have had their own Parliaments, but the latter are ruled by princes owing allegiance to the King-Emperor, who is represented in India by a Viceroy. In 1946 a British mission visited India, and, in consultation with Indian leaders, made plans for the country to become independent in the near future.

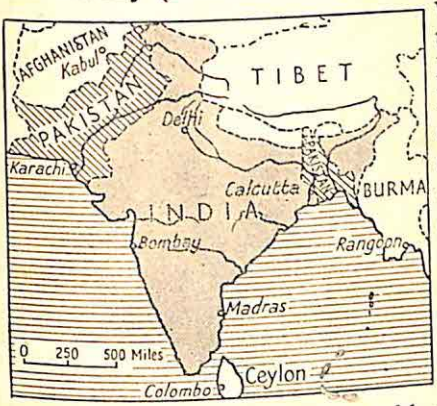
Position and Size. Though India is cut off from continental Asia by a mountain barrier, the Empire extends across the mountains to include Baluchistan on the west, and Kashmir, lying amidst the ranges of the Western Himalayas. The area of India is nearly 1,600,000 square miles. Within her borders live some 338,000,000 people, or about one-fifth of the human race.

Weather and Climate. Nowhere else in the world is the monsoon type of climate so well marked as in India, and in no other region of similar size do so great a number of people depend for their prosperity on climatic conditions. In most parts of India there are three seasons. The cold season lasts from October to March; the hot season from April to mid-June; and the rainy season from mid-June to October. The term 'cold' is a relative one. In the south of India temperatures during the cool season resemble those of the Mediterranean Lands in early summer. In the Indo-Gangetic Plain, January temperatures are about the same as June temperatures in the south of the British Isles. Elevated regions, like the Vale of Kashmir,

INDIA

Government

On 15 August 1947 India became independent of Britain, and the country (which is one unit geographically and economically) was divided politically into the Dominion of India and the Dominion of Pakistan. The Indian States were free to join either Dominion or to be independent. The map shows the areas of Pakistan and India. It should be compared with figures 171–84. The reason for the division of the country into these two states was mainly a religious one: the large Moslem minority in old British India did not consider that they would receive fair treatment from the Hindu majority when British control was relinquished. The religious division of the country does not coincide with its geographical divisions. Pakistan, the predominantly Moslem state (with a total population of about 70 millions) is divided into two parts with over 1,200 miles between its capital, Karachi, in the western part, and the densely populated Bengal area in the eastern part. The Dominion of India, the predominantly Hindu state, has a population of about 330 millions: its capital is Delhi.



CEYLON (*see* p. 388).

In 1948 Ceylon became a Dominion.

BURMA (*see* p. 391).

In 1948 Burma became an independent republic outside the British Commonwealth.

have a temperate climate: the winters are considerably colder than in the British Isles, but the summers are hotter.

The Cold Season. From October to January temperatures decrease, while air-pressures increase from the south to the north-west of India, which is the centre of a high-pressure system. Towards the end of October the winter monsoon winds start blowing over India from the high-pressure areas over the land towards the areas of low

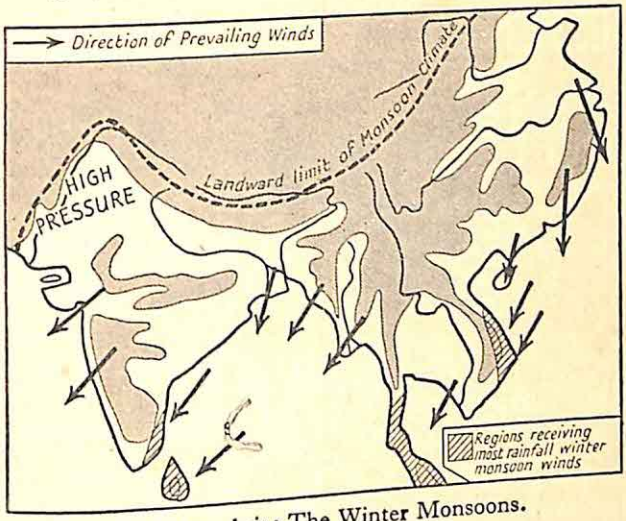


FIG. 171. Asia: The Winter Monsoons.

pressure over the sea. Except where they have crossed the sea, they are dry winds. They blow mainly from the north-east, but in the Ganges valley they come from the north-west. The north-east winds, which gather moisture as they pass over the Bay of Bengal, bring rain to the south-east of India. North-West India also receives some rain during the cool season from depressions coming from Iran and Afghanistan. Apart from the south-east and north-west, the greater part of India receives little rain during the cold season. The skies are cloudless, the days brilliantly sunny, and even in the rainy areas there is far less cloud and more sunshine than there is on an average summer day in the British Isles.

The Hot Season. As the sun moves northward towards the Tropic of Cancer temperatures rise and pressures diminish. In May the hottest area, and that with the lowest pressure, lies over the Deccan,

but by June the low-pressure system has moved north and is centred over the Indus lowlands and Baluchistan. The heat is intense and by the beginning of June is in the plains almost unbearable. There is a considerable daily range of temperature, and the nights are hotter than very hot summer days in England. The south-west of India receives rain in April and May, as does Assam, where it is of

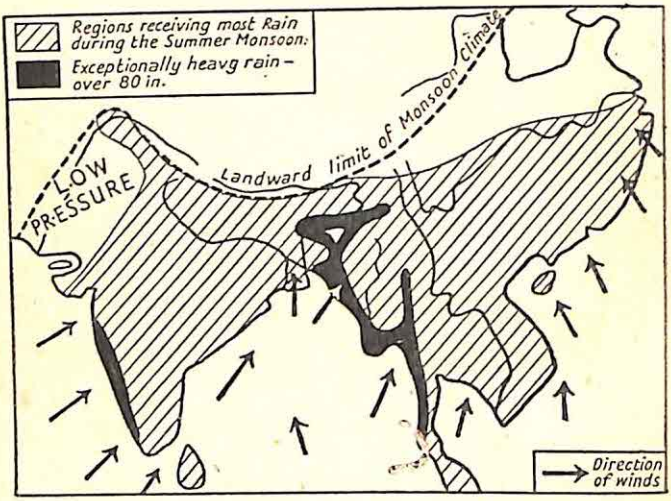


FIG. 172. Asia: The Summer Monsoon.

great importance for the tea crop; but with these exceptions the rainfall throughout India is negligible.

The Rainy Season. Towards the end of May winds blowing from the south and west cause violent storms, with heavy showers, which are repeated every few days. These storms herald the south-west monsoon—the rain-giver of India—which 'bursts' about the middle of June, when rain descends upon the parched earth in torrential downpours accompanied by thunder and lightning. The south-west winds, blowing across the Arabian Sea, cause heavy rain on the windward slopes of the Western Ghats and the strip of the Malabar Coast at their base, both of which have over 80 inches of rain per annum. But the Deccan Plateau, on the leeward side of the Western Ghats, receives only a moderate rainfall (about 40 inches per annum), while the belt near the eastern foot of the Ghats, lying in the rain shadow of the mountains, has 30 inches or less a year.

The south-west of the table-land is better watered: it receives rain both from the south-west and the retreating north-east monsoon, and the dry period is limited to two or three months.

South-west monsoon winds, blowing across the Bay of Bengal, cause an extremely heavy rainfall (over 80 inches per annum) on the windward slopes of the mountains in Burma and Assam. Other monsoon winds from the Bay, reinforced by south-west winds from the Deccan, blow up the funnel-shaped Ganges valley, causing heavy

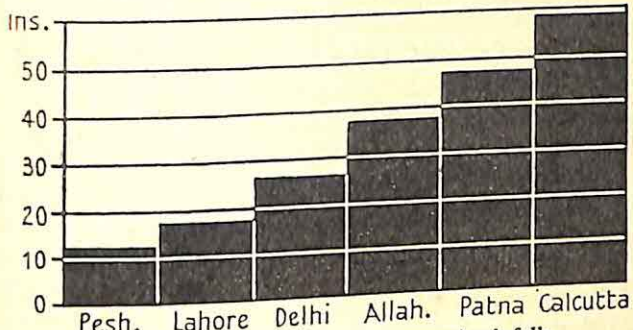


FIG. 173. India: Comparative annual rainfalls.

rain along the eastern windward slopes of the Himalayas and the plains at their base (over 80 inches). But these winds lose most of their moisture as they travel up the valley and reach the Punjab as dry winds. Calcutta has an annual rainfall of 59 inches compared with 18 inches at Lahore: in both cases the bulk of the rain falls during the summer monsoon. The south-west monsoon winds, blowing towards north-west India, are relatively dry, for they have not crossed a large expanse of ocean. Some blow up the Indus valley, but most are deflected to the north-east along the margin of the Deccan, leaving the Thar Desert between the Indus and the tableland of Peninsular India.

'After four to six weeks of heavy rain, often falling uninterruptedly for two or three days in succession, the weather clears up, and sometimes some weeks pass without further rains; after which a week or two of more wet weather brings the rainy season to a close.'[1] Owing to the presence of clouds temperatures are, as a rule, less than in the preceding hot season, but with the clearing of the skies towards the

[1] *The Climates of the Continents:* Kendrew (Clarendon Press).

end of the rains they tend to rise somewhat for a short time. Upon the rain, brought by the south-west monsoon, millions of farmers depend for their livelihood. Occasionally in some districts—but never in all—the monsoon fails, with the result that famines occur.

THE PEOPLES OF INDIA

Races, Religions, and Languages. Little trace now remains on the mainland of the earliest occupants of the country, who probably belonged to the Negrito (small negro) race. Other peoples, originating in Palestine, who followed them and also settled in the Ganges valley, may be regarded as the true aborigines of India. The centuries rolled by. Then came an early branch of the Mediterranean race, practising simple agriculture, who too made their homes in the plain of Hindustan. Later, but in the still remote past, more advanced Mediterranean peoples, having some knowledge of metals though not of iron, coming first from the Persian Gulf and afterwards from Eastern Europe, spread over the Indus plain and ultimately advanced eastward into the Ganges valley, in both of which regions they developed a prehistoric civilization. About 3000 B.C. folk from the Pamirs and the Plateau of Iran entered India. The majority spread southward along the west coast, but some found their way into the Ganges plain. Meanwhile, Mongolians filtered into India from the east and established themselves in Burma and in the southern valleys of the Himalayas. About 1500 B.C. successive waves of Indo-Aryan invaders from Central Asia streamed through the north-west passes, occupied the Punjab, and overran Hindustan. They imposed their own culture on the surviving civilization and from the combined material arose 'the philosophy, religion, art, and letters that were the glory of ancient India'.[1]

Religions. In India, however, religion rather than race is the dividing factor. In no other country do religious differences play so great a part in everyday life. Of the 338 million people who inhabit the country under 2 per cent. are Christians, a few are Buddhists or Parsees, some belong to other religions, but 70 per cent. are Hindus and 21 per cent. Mohammedans.

Hinduism is one of the oldest religions in the world. One-eighth of the people of the earth, and one-half of the inhabitants of the British Empire, practise this religion. Its most striking feature is

[1] Based on *Census of India*, vol. i, 1933.

the idea of *caste*. A Hindu believes that every man is bound to the caste, or class, in which he is born. The four great divisions of castes are the *Brahmins*, to which belong all the priests, though all Brahmins are not priests; the *warriors*; the *farmers* and *craftsmen*; and the *serfs*. To be 'outcast' is a great stigma. If a Hindu loses his caste he may not marry within it, and is not even allowed to join in the common meal or in smoking a friendly hookah, or pipe. The three chief Hindu gods are Brahma, Siva, and Vishnu. *Brahma*, after creating the world, retired, leaving the rule and care of mankind to Siva and Vishnu. *Siva* is the favourite god in Southern India, and there is scarcely a village without a shrine in his honour. *Vishnu* is very popular with all classes of Hindus. Thousands of Hindu pilgrims travel every year to bathe in the holy rivers of the Ganges, Jumna, and Godavari, and so secure blessings in expiation of sins.

Mohammedanism, the other great religion of India, was introduced into the country by invaders who poured through the Afghan passes from the eleventh to the sixteenth centuries. Though scattered throughout India amidst the Hindu population, the Mohammedans are strongest in the north-west and in Eastern Bengal.

The two great religions of India have little in common, but the people show each other much neighbourly kindness. Rigid caste divisions are gradually being broken down, especially in the towns, as a result of travel, intermarriage, and more liberal thinking.

Languages. English, as we have seen, is the official language and is understood by many educated people throughout India, but Hindustani is the most widely used, and in Bengal and the neighbouring provinces of Assam and Bihar and Orissa some 50 millions of people speak Bengali. Yet, incredible as it may seem, some 222 languages are spoken in India, and the person 'who wishes to make himself generally understood in all parts of the country (without including special areas or remote tribes) would have to be master of as many separate tongues as a linguist who was prepared to accomplish the same achievement in Europe'.[1]

Distribution of Population. Though India contains numbers of large cities, yet 90 per cent. of her 338 million people live in villages, and 75 per cent. (as we have already seen) are dependent on the

[1] *Report of the Indian Statutory Commission:* Vol. i, 1930.

cultivation of the land for their livelihood. Agriculture, and rainfall to which it is so closely allied, provide the keys to the distribution of population. The most highly productive and consequently the most thickly peopled regions are plains receiving a heavy rainfall. Thus

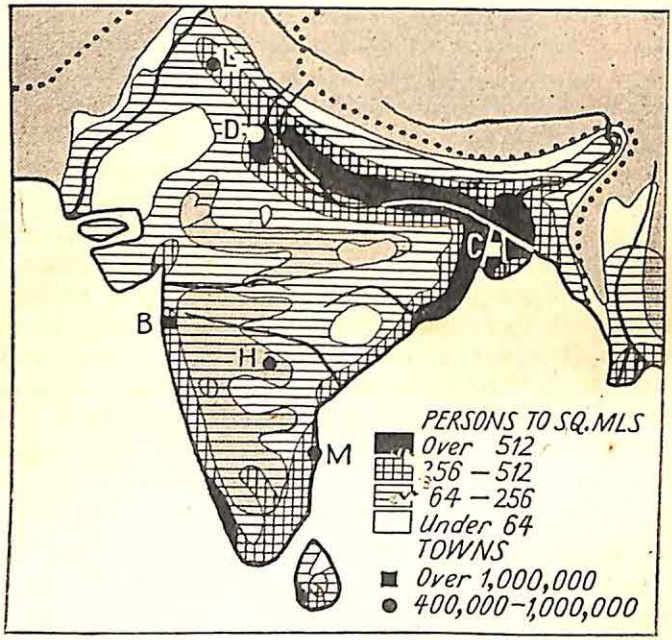


FIG. 174. India: Distribution of Population.

in the Ganges valley, and notably in Bengal with over 615 persons to the square mile, the population is extremely dense, as it is also on well watered coastal lands like those of Travancore in the south-west. Next in order comes the Punjab, where, thanks to large-scale irrigation works, there is considerable agricultural activity. The most sparsely peopled areas are those, such as Rajputana, which receive little rain and cannot be widely irrigated; and mountainous regions like Kashmir where, despite the invigorating climate, the rugged relief prohibits close settlement.

NATURAL REGIONS OF INDIA

We may divide India into three major Natural Regions: (1) the Mountains of the North and North-West; (2) Peninsular India; and (3) the Indo-Gangetic Plain, or the Plain of Hindustan.

(1) **The Mountains of the North and North-West.** The Himalayas with the Pamirs, Hindu Kush, Sulaiman, and other ranges form a mountain wall shutting off the great sub-continent of India from the rest of Asia. When we remember that the Himalayas themselves extend for 1,500 miles, that the average elevation of their higher ranges is 18,000 feet, and that they vary in width from 300 miles in the west to 150 miles in the east, then we begin to realize the formidable nature of this mountain barrier whose height and breadth exceed those of any other in the world. Between the great fold-ranges lie longitudinal valleys so deep and inaccessible that they are useless as routes. The main chain of the Himalayas, rising south of the Indus and Brahmaputra valleys, culminates in such peaks as Everest (29,141 feet), as yet unconquered by Man, and Kinchinjunga towering to 28,146 feet. On its southern side this main chain descends steeply through the sub-Himalayan chains to the Indo-Gangetic Plain.

The Tibetan Plateau, north of the Indus and Brahmaputra valleys, is crossed by numerous fold ranges. North-east of the Indus valley rise the Karakorams, which form the divide between the streams flowing into the Indus, and those forming part of the inland drainage region. Among the many peaks in the Karakorams is Mount Godwin-Austen (28,250 feet), the second highest in the world.

It is not surprising that the passes across the Himalayas are high —numbers approach 17,000 feet—and that the valley-routes are difficult. Though not of great importance they are still used, and those communicating with Tibet are the only ones by which that mountain state can carry on trade with India. Study the position of the chief passes on the map (Fig. 175). (1) From Darjeeling a route runs through Sikkim to the Chumbi valley and thence across difficult country to Lhasa, the capital of Tibet. (2) Farther west the road from Hindustan winds up to Simla, 'the summer capital of India', set amidst pine woods and gardens, whence it continues to Gartok,

in the west of Tibet. (3) From Rawalpindi (Punjab) the road runs up the Jhelum valley to Srinagar, the capital of Kashmir, from which (4) a difficult route leads to Leh, on the upper Indus; thence to the Shyok valley which it ascends to the Karakoram Pass (18,000 feet), whence it is continued to the Tarim Basin.

South of the Hindu Kush, the Sulaiman and Kirthar Mountains rise steeply from the Indus lowlands. This mountain wall, much lower than the Himalayas, is crossed by three relatively easy passes.

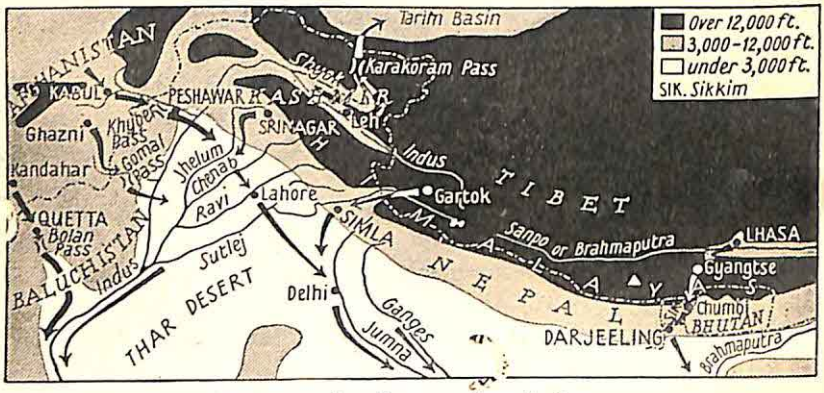


FIG. 175. Land routes into India.

(5) The *Khyber* (3,400 feet), the route by which most of her conquerors entered India, leads from Peshawar to Kabul, the capital of Afghanistan. (6) South of the latter pass is the Gomal Pass leading from the Punjab to Ghazni. This route, one of the oldest of all trade routes, passes through the wild district of Waziristan, inhabited by fierce Wazris. (7) The *Bolan Pass* (5,900 feet), between the Sulaiman and Kirthar Mountains, is followed by the railway from the Indus valley to Quetta, the capital of British Baluchistan, whence it is continued to Zahidan (Duzdap).

The southern slopes of the Himalayas, especially the eastern and central portions, receive heavy rains during the summer monsoon. At the base of the mountains stretches a tropical belt, the Terai, some 20 miles wide, where rather open forests, composed chiefly of sâl trees, are intermingled with marshy jungles, and grass-lands with giant bamboos and palms. In the cooler regions from 3,000 to 6,000 feet the trees resemble those of temperate lands. In April and

May magnolias and rhododendrons—as large as English horse chestnuts—are in bloom. From 6,000 feet the chief trees are deodars and oaks, while in sheltered valleys grow apples, pears, chestnuts, evergreen oaks, laurels, and maples. These are succeeded by pines, larches, and other conifers which grow up to 12,000 feet. Above this height the trees become stunted, passing into Alpine pastures, in spring and early summer bright with flowers like poppies, gentians, and edelweiss. Higher still are tundra which, between 16,000 and 17,000 feet, merge into the region of perpetual snow.

Tea is grown on the hill-sides of Assam and round Darjeeling, where it is a seasonal crop. 'In North-east India the bush sends out new shoots in spring and if plucked continues to flush through summer. Unless plucked there are two main periods of growth: spring and autumn.'[1]

To the west of Darjeeling lies *Nepal*, somewhat larger than England: to the east is *Bhutan*, another independent country. *Kashmir*, in the west of the Himalayas, lies at an elevation of from 5,000 to 7,000 feet. Its capital *Srinagar* stands on the Jhelum river, the chief highway of this Indian state.

(2) Peninsular India. South of the Indo-Gangetic Plain the greater part of the country is occupied by an old crust-block forming the plateau of Peninsular India (Fig. 176). On the west this plateau is margined by the Western Ghats (steps) whose steep escarpments rise above the narrow plains of the Malabar Coast, nowhere more than 50 miles wide. Towards the east the more broken Eastern Ghats descend gently to the wider lowlands of the sandy, surf-beaten, and harbourless Coromandel Coast. On the north-west the plateau extends to the Aravalli Hills, beyond which the Thar Desert bars the way to the Indus lowlands.

East to west ranges, crossing the northern part of the plateau, render communications difficult between north and south. They include the Vindhya Hills to the north, and the Satpura Hills and the Mahadeo Hills to the south of the Narbada valley. The line of the two latter ranges is continued east by the Maikal Mountains. The Narbada and Tapti flow west to the Gulf of Cambay. The Tapti valley is followed by railways leading (i) to the plateau and (ii) through the Kwandwa Gap to the Narbada. South of the

[1] Harler, *The Culture and Marketing of Tea.*

Tapti the Western Ghats form a barrier between the Malabar Coast and the interior. The only easy route lies in the south where it traverses the Palghat Gap, between the Nilgiri and Anaimalai Hills.

The Mahanadi, Godavari, Kistna, Penner, and Cauvery flow

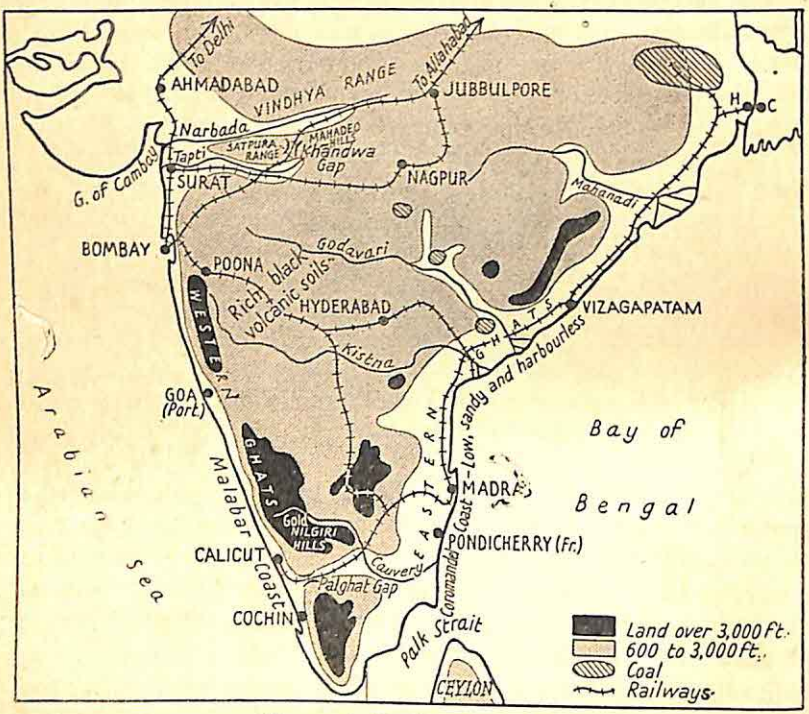


FIG. 176. Peninsular India.

south-east across the plateau to the Bay of Bengal. In their upper courses they speed through deep inaccessible gorges descending by falls, some of which, like those on the short swift streams flowing down the Western Ghats, are harnessed for hydro-electric power. In their lower courses the rivers flowing into the Bay of Bengal form deltas, at the head of which dams have been built to store water for irrigating the rice fields of the lowlands.

Though the term 'Deccan Plateau' is often applied to the whole of the upland area of Peninsular India, strictly speaking it includes only the western part of the region, stretching from the Tapti valley

southward to the Nilgiri Hills. In geologically recent (Tertiary) times, the north-west of the Deccan was covered with lavas which welled up through great fissures in the earth's surface, forming what is now one of the most extensive and deepest *lava-flows* in the world. These basaltic rocks have weathered to form a rich black soil, retentive of moisture. In the south-west of the Deccan and also

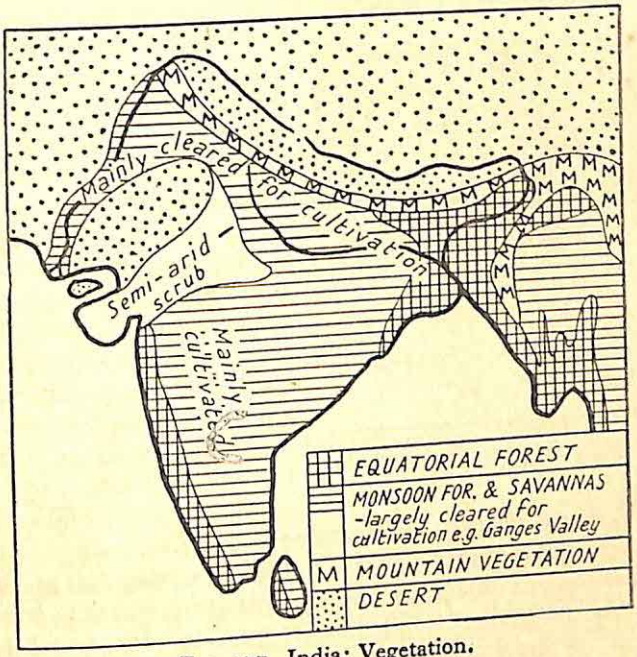


FIG. 177. India: Vegetation.

along the east coast, south of the Mahanadi delta, the soils are composed of red laterites[1] which, on account of their porous character, make irrigation essential in districts where they predominate.

Forests still cover considerable areas in Peninsular India. Owing to the heavy rainfall (over 80 inches per annum) luxuriant forests with coco-nut palms (especially in the maritime districts) are found

[1] *Laterites.* Owing to the chemical disintegration of rocks, in tropical regions with alternating wet and dry seasons, certain chemical substances, such as potash, are dissolved leaving behind soils composed mainly of alumina and iron oxides, the latter being responsible for the red colour. Thus laterite soils are generally poor and sometimes quite useless for cultivation.

along the Malabar Coast; while the windward slopes of the Western Ghats are also thickly wooded. Very different is the Coromandel coast, where, owing to the lower annual rainfall (under 40 inches), long stretches are covered with evergreen jungle which, however, gives way in the deltas to fertile irrigated tracts—veritable oases—usually planted with rice. On the plateau itself rainfall also provides the key to the natural vegetation. Broadly speaking, the north-west has less rain than the south-east, and the driest portion is the belt lying in the rain shadow of the Western Ghats. Despite cultivation, much of the original forest character is still preserved. In districts where the annual rainfall, though below 80 inches, is more than 40 inches are found monsoon forests with *teak* and other deciduous trees which shed their leaves in the dry season. But such forests are by no means continuous and are interspersed with stretches of semi-arid scrub, while a further contrast is provided by the densely wooded river valleys.

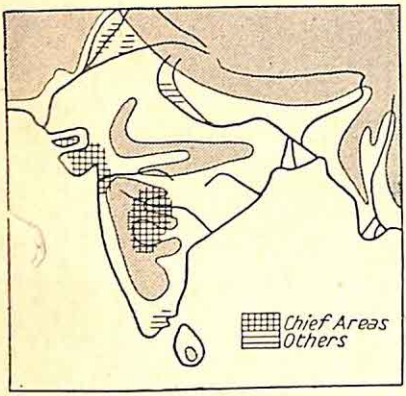


FIG. 178. India: Distribution of Cotton.

Cotton is grown in the Gujerat, to the east of the Gulf of Cambay, as well as in the Punjab, but the principal cotton-growing area in the country is the north-west of the Deccan. Here the deep black and rather heavy basaltic soils by holding the moisture from the monsoon rains make irrigation unnecessary for cotton growing; but the 'going' is hard, and sometimes six yoke of oxen are needed to draw the lumbering ploughs used to break up the heavy clods. The Deccan crop is mainly Indian native cotton of the short-staple variety which is not of a very high quality.

Millet is widely cultivated as a food crop in the drier parts of the Peninsula. The seed is ground into flour; the stalks provide fodder for cattle; the straw is used for making fences, and when plastered with mud yields material for building the walls of huts. Of the many pulses the chief is *gram*, or chickpea, which besides being a valuable food grain also fertilizes the soil. *Ground-nuts* and *oil-seeds*

(linseed, castor, and sesame) are important crops in the drier areas. Both yield oil, at one time used mainly for lighting and heating, but now widely produced for export, as it is in great demand by manufacturers of soap and margarine. Some *wheat* is cultivated as a cool season crop in the north of the plateau, but south of the Tapti and Mahanadi valleys temperatures are too high. A certain amount of *coffee* is grown in Mysore, and *tobacco* is also cultivated in this state, Travancore, and Madras.

Rice is the chief crop on the lowlands. In the deltas along the Coromandel coast three crops are produced each year on lands irrigated by *canals*, and also (notably in parts of the Madras Presidency) by means of water drawn from *wells*.

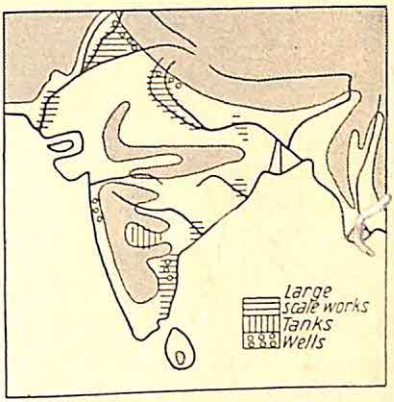


FIG. 179. India: Irrigation.

The building of the Lloyd Dam, south of Poona, and the Krishnarajasagara and Mettur Dams, on the Cauvery, have enabled large areas of former waste lands to be brought under perennial irrigation by means of canals. But in most parts of the plateau it is not possible to construct large-scale works of this nature as the rivers flow in steep valleys far below the general surface level. Water for irrigation is obtained mainly from tanks, reservoirs varying in size from ponds to lakes several square miles in area. They are made by building mud dams across the valleys of small streams depending for their water on the monsoon rains. This method is widely practised in the native states of Hyderabad and Mysore.

India is not rich in *minerals*, the chief ones being found in the old crust-block of Peninsular India. Iron ores are widely distributed throughout the plateau, where coal of a rather low grade is also mined. The principal *coal-field* lies to the north-west of Calcutta, where it stretches from the west of Bengal, through Bihar, into the east of the Central Provinces. The chief centres are Ranigang and Jharia, the former 100 miles and the latter 140 miles north-west of Calcutta. The iron found in this coal-field supplies important iron

and steel works at Jamshedpur, 140 miles west of Calcutta. Coal is also mined in the native state of Hyderabad. The consumption of coal is small, for owing to the warm climate little is required for heating and it is rarely, if ever, used for domestic purposes, while, as manufacturing is in its infancy, relatively little is needed for factories.

Manganese ore, required for making certain high-quality steels, is found in the Central Provinces and Madras. The quartz reefs of the Kolar gold-field in Mysore have for the last half-century yielded a steady output of gold. On this field the machinery in the mines is electrically driven with power obtained from the Krishnarajasagara Dam on the Cauvery river. Mica is mined in Northern Bihar and Madras. Salt, one of the most valuable and useful mineral products of India, is obtained in the coastal lands by the evaporation of sea-water.

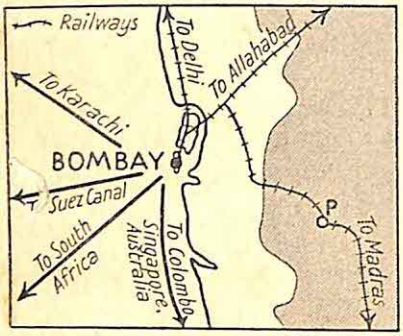


FIG. 180. Site of Bombay.

Situated on an island, beside the only natural deep water harbour on the west coast of India, the central position and accessibility of *Bombay* (1,160,000), the second largest city in the country, have made her the chief entrepôt port of the Deccan, and, many would say, of India herself. Since the opening of the Suez Canal, which brought Bombay nearer to England by sea than Calcutta, she has never looked back and now rivals in importance the great port of the Ganges. As the immediate hinterland of Bombay includes the cotton-growing area of the Deccan, she has become the chief port in India both for the export and manufacture of cotton. Behind the city rises the steep escarpment of the Western Ghats, up which the railway zigzags to the tableland. It then divides. One line runs south-east through *Poona* to Madras; the other north-east to the Tapti valley, where the branch to Calcutta continues up the valley making for *Nagpur*; and that to Allahabad runs through the Khandwa Gap to *Jubbulpore*, a town with large railway works and cotton mills. The line to Delhi runs north along the coast through Surat, a few miles up the Tapti, with cotton, rice, and paper mills, to

Ahmadabad (314,000), a cotton manufacturing town picturesquely placed at the head of the Gulf of Cambay. *Madras* (647,000), with an artificial harbour, is the third largest city in India, but as a port ranks far behind Calcutta or Bombay. To the south of Madras lies the French possession of *Pondicherry*. Note the railway running in a westerly direction from Madras, through the Palghat Gap, to *Calicut*, which exports some coffee. Almost midway between Calicut

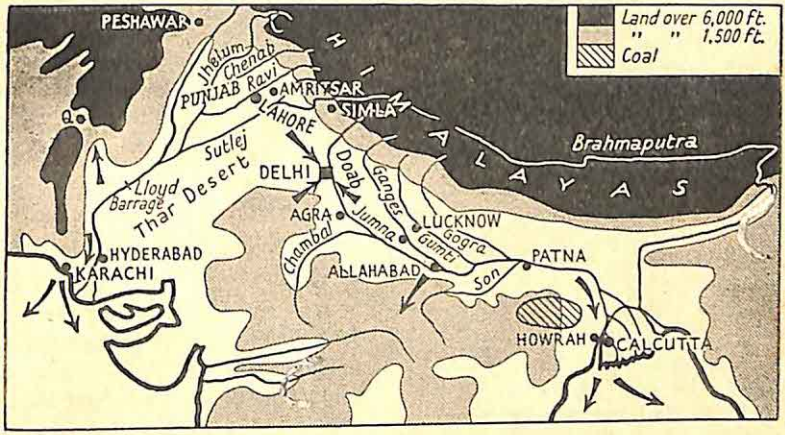


FIG. 181. The Plain of Hindustan.

and Bombay is the small Portuguese possession of *Goa*. The ports of Vizagapatam, on the east coast, and Cochin, on the south-west, are rapidly growing in importance.

(3) **The Indo-Gangetic Plain or the Plain of Hindustan.** Between the great fold-mountains of the Himalayan system and the old crust-block of Peninsular India is the *Plain of Hindustan*, one of the most productive and thickly peopled lowlands in the world. This vast depression, an arm of the sea that has been filled up with sediment brought down by the Indus, Ganges, Brahmaputra, and their tributaries, is constantly being replenished by silt transported by rivers and spread over the land during floods. A low divide, rising to scarcely 1,000 feet, which connects the Himalayas with the plateau to the south, separates the basin of the Indus from that of the Ganges.

(*a*) **The Indus Lowland.** After leaving the Himalayas, the

Indus enters the Plain of the Punjab—'the land of the five rivers'—where it receives its five great tributaries, the Jhelum, Chenab, Ravi, Beas, and Sutlej. In spring these streams trickle over broad boulder-strewn beds, but in summer, fed by the melting snows of the Himalayas, they form wide, deep rivers whose waters bring fertility to the thirsty land. In its lower course the Indus, like the Nile, receives no tributaries. It flows between the Thar Desert and the Kirthar Range (marking the eastern edge of the Plateau of Baluchistan), entering the Arabian Sea by a delta.

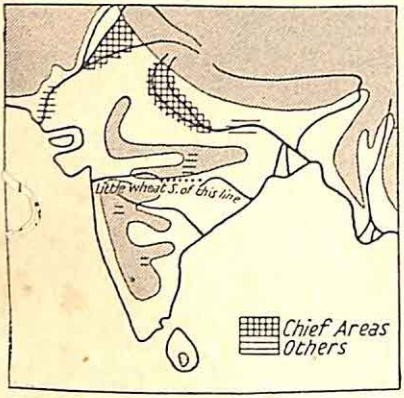
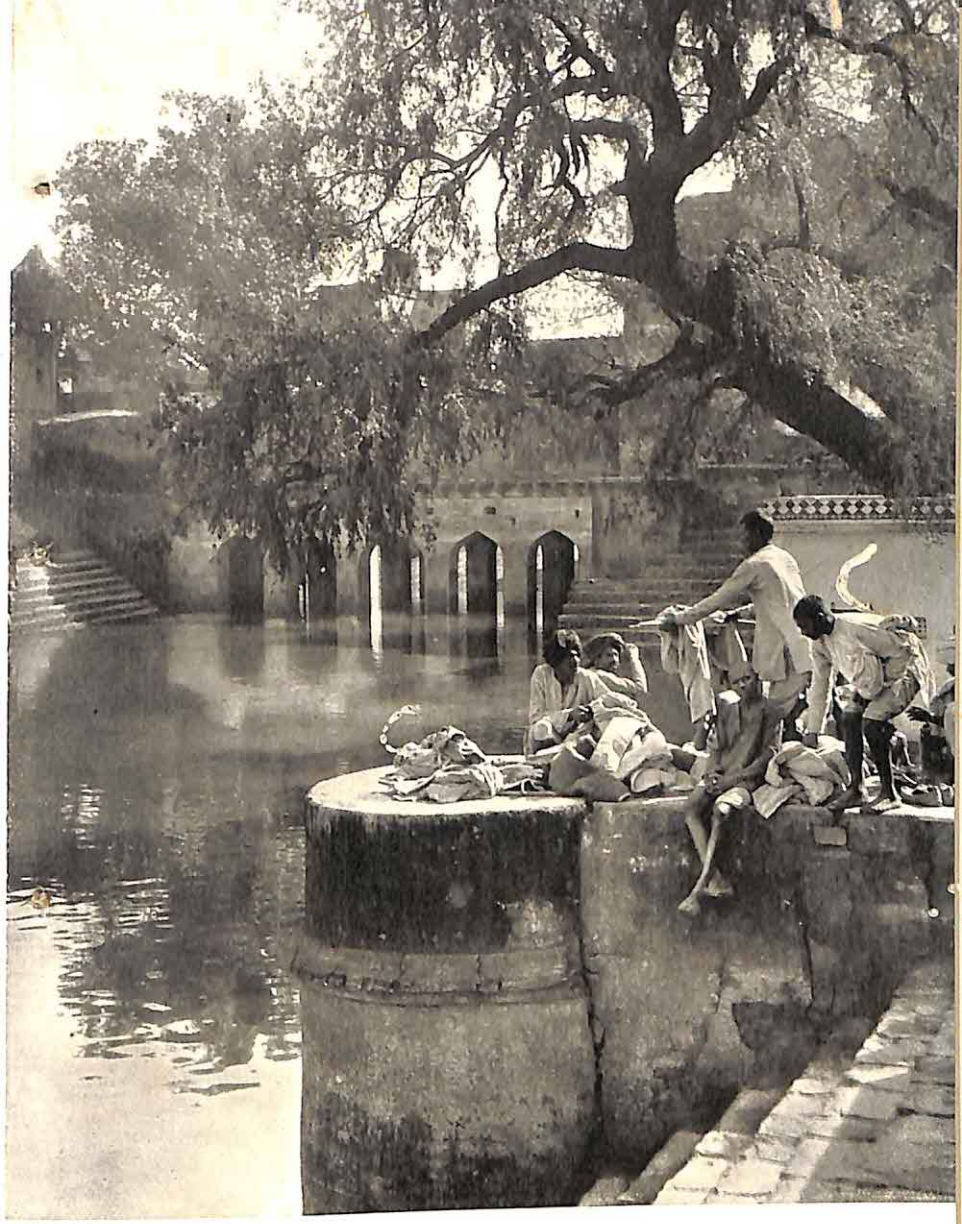


FIG. 182. India: Distribution of Winter Wheat.

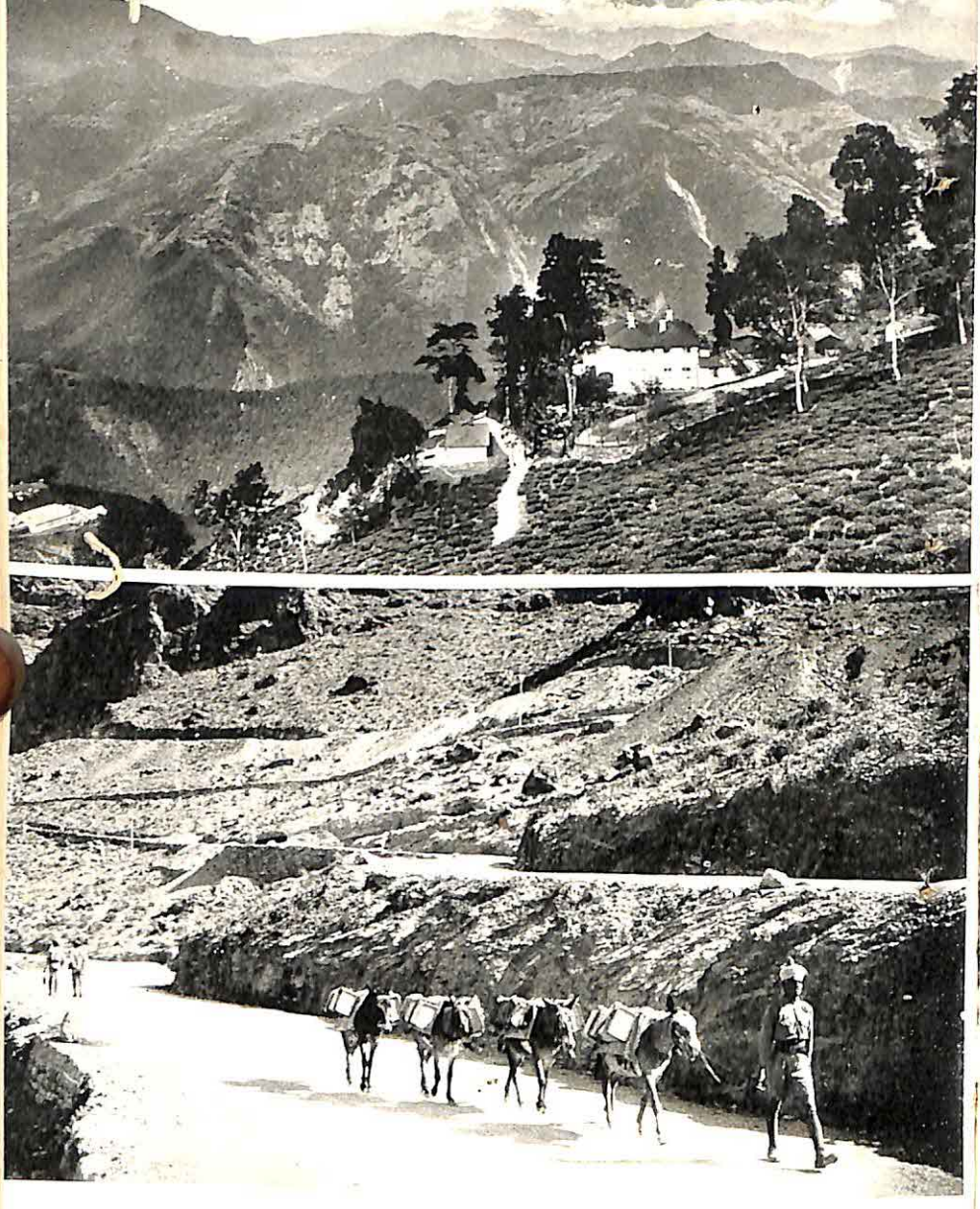
The annual rainfall is low in the Punjab (Lahore receives only 18 inches, of which slightly more than half falls in July and August), and negligible in the lower Indus basin (Karachi 6 inches). Much of the latter region is quite arid, but the Lloyd Barrage, at Sukkur on the Indus (completed in January 1932), has already made it possible to irrigate a large acreage in Sind. In the Punjab waste lands, whose area is somewhat more than that of Wales, have been made fertile mainly by large-scale irrigation. Barrages, built where the rivers leave the hills, hold back water which is used for perennial irrigation by canals running at a lower level. In some parts of the Indus basin, inundation canals are led off direct from the rivers, whose surplus flood waters are thus utilized for agriculture. Irrigation from wells is also common in the Punjab in districts—such as those near the foot of the mountains—where water lies relatively near the surface.

Owing to the low rainfall of the Punjab, the natural vegetation consists mainly of evergreen scrub with deciduous woodlands in some of the more favoured areas, and trees along the banks of rivers and canals. The prevailing vegetation in the arid lower Indus basin consists of scattered herbage dotted with thorny scrub (acacias and tamarisks); but palm trees thrive in the oases, and lines of trees often margin the watercourses, which are dry for most of the year.



21. AT THE TANK IN SOUTHERN INDIA

In India, irrigation from artificial reservoirs, or tanks, has been carried on from early times, though confined to certain parts of the country, such as the native states of Hyderabad and Mysore. The tanks vary in size from lakes, covering several square miles, to small pools drawn off from a river.

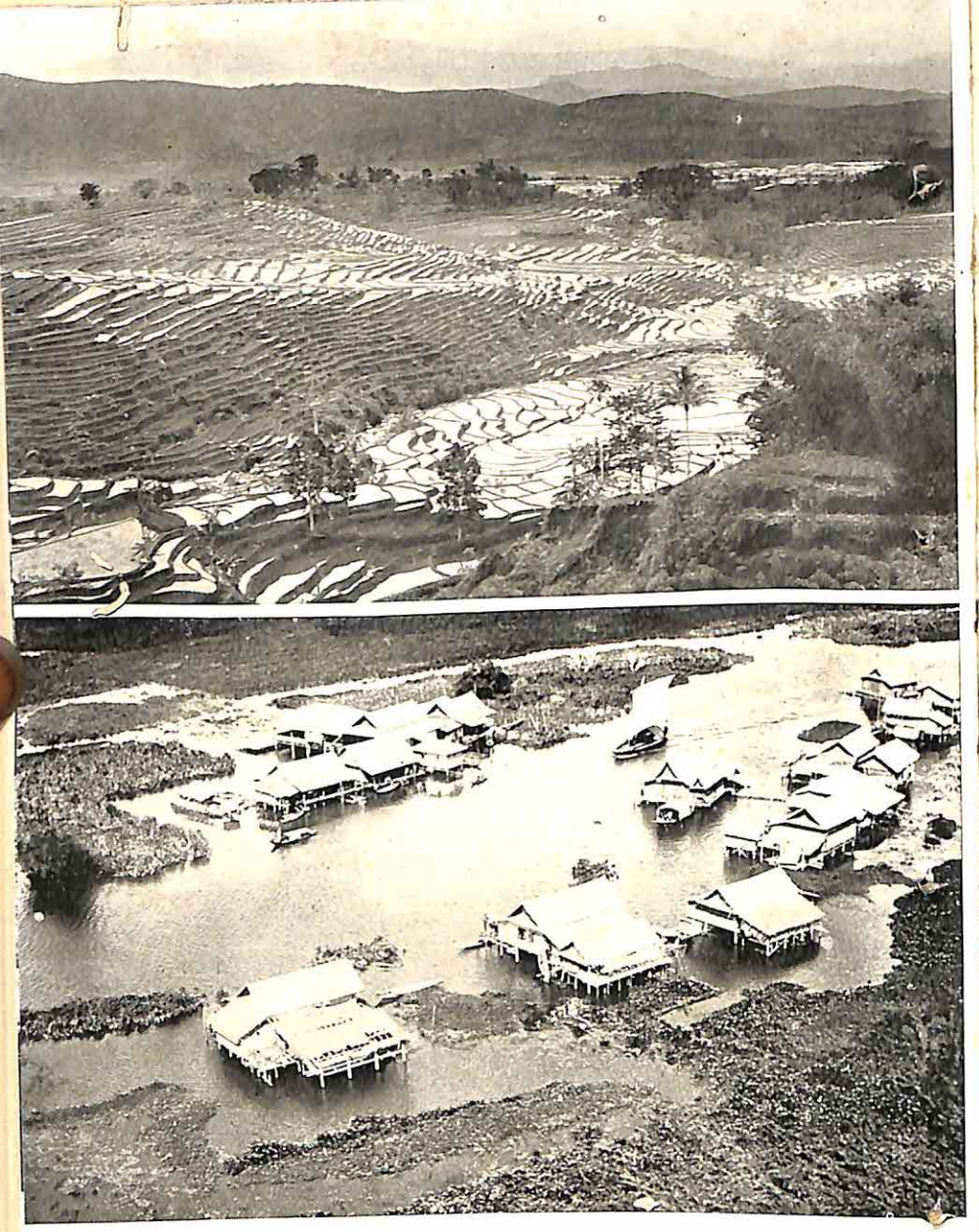


22. MOUNTAIN SCENES IN INDIA

(*Above*) A Tea Plantation in Assam where the slope provides that natural drainage required for the successful cultivation of the crop. The tea-growing area extends westward to Darjeeling, along the foothills of the Himalayas which here may be seen in the distance. Note the factory to which the leaves are taken to be withered, rolled, fermented, dried, and graded before being packed in chests for export (see p. 277). (*Below*) Pack-mules passing through the Khyber Pass, the grim defile, 33 miles long, through which most invaders entered India (p. 276)

23. TEAK AND RICE

(*Left*) Elephants hauling teak logs to a Burmese saw-mill. The logs are floated down the rivers from the forests of Upper Burma, which are leased by the government to companies. The trees grow in single stands. (*Right*) Planting rice. Grown in a nursery plot, the young plants, tied in bundles of four or five, are here being transplanted. With a deft movement of the hand, the workers thrust each bundle into the rich mud of the field, which must be kept irrigated until the leaves turn yellow and the rice



24. TERRACED CULTURE—A SIAMESE VILLAGE

(*Above*) Terraced hill-sides in Java where the crops grown vary with the elevation (see p. 302). (*below*) the Siamese village the houses are built on platforms so as to be secure against the floods (see p. 296).

Owing to its greater rainfall, and to more extensive irrigation, the Punjab is more productive than the lower Indus lowlands. Wheat, barley, most millets, pulses, and linseed are among the more important cool season crops, which are harvested in March and April. The rainy season crops, gathered from October to December, include cotton and sugar-cane. High-grade American cottons have been introduced into the Punjab and Sind where they do well on irrigated lands. Thus in the Indus lowland, as in most parts of India, there are two harvest periods. Directly the sun-baked ground is moistened, by rain or irrigation, the work of the *ryot* (peasant) begins and is incessant until the harvest is gathered. The blade as it appears above the ground must be guarded from stray cattle, wild pigs, deer, and monkeys; while later, when crops such as cereals begin to ripen, they must be protected from flocks of birds, especially parrots. As soon as grain is brought in from the fields it is threshed by bullocks or cows, which trample on it as they are driven round and round the clay threshing floors. The winnowing is done by throwing the mixed grain and chaff into the air, when the wind blows away the chaff and allows the heavier grain to fall to the floor.

Bullocks are universally used throughout India for draught purposes, and, in passing, it may be noted that there are more cattle in India than in any other country in the world. They are of the humped variety and are usually grey or white in colour. The great cattle-rearing belt of India stretches from the Gujerat along the eastern margin of the Thar Desert and thence through the Punjab into Kashmir. The greater part of this belt has a low rainfall, and thus salts—so necessary for the health of animals—are not washed out of the soil. In the Punjab, and in other parts of India, many sheep and goats are bred for meat and hides rather than wool, which is of poor quality. In the Punjab, the lower Indus, and the adjacent Thar Desert camels are used for transport purposes.

Karachi (260,000), the nearest Indian port to Europe and an airport on the route from London to Singapore, Australia, and New Zealand, is the outlet for the Indus Basin. It lies to the west of the delta, and its modern harbour has recently been enlarged to cope with increasing trade following the extension of irrigation in Sind. Its chief exports are wheat, shipped in April and May, and cotton from the Punjab and Sind of which province it is the capital. From Karachi the railway runs up the Indus valley to *Hyderabad* (Sind) and thence

to Sukkur. Here a line runs through the Bolan Pass to Quetta and Zahidan. *Quetta*, the capital of British Baluchistan, was entirely destroyed by an earthquake in 1935, but has since been rebuilt. The main railway from Sukkur continues up the valley to *Multan* and thence follows the Ravi valley to *Lahore* (429,000), the capital of the Punjab, with flour mills, refineries where seeds are pressed for oil, and factories where candles, saddles, soap, and shoes are made. It is an important junction from which lines run north-east to *Amritsar* (265,000); south-east to Delhi; and north-west through *Rawalpindi* to *Peshawar*, guarding the route through the Khyber Pass.

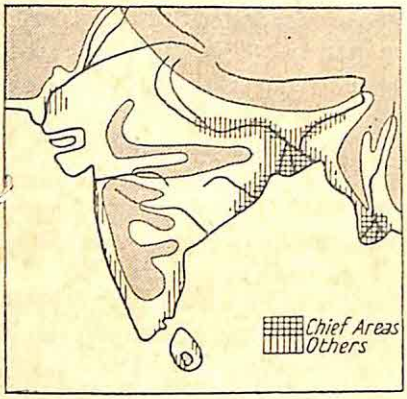


FIG. 183. India: Distribution of Rice.

(*b*) **The Ganges Lowland**, with its very fertile alluvial soil, its heavy summer rainfall, and relatively high temperatures, is the most densely peopled part of India. Unlike the Brahmaputra, Indus, and Sutlej, all of which rise on the northern side of the Himalayas, the Ganges has its source on their southern slopes from which many snow-fed tributaries, including the Jumna and the Gogra, descend to the main stream. The chief right-bank feeders are the Chambal and the Son. The Ganges has been pushed south by its Himalayan affluents, which are swifter, greater in volume, and more numerous than the streams descending from the Plateau to the south. The silt-laden waters of the Brahmaputra have united with those of the Ganges to form a vast delta, crossed by many distributaries, which is steadily advancing farther into the Bay of Bengal.

From early times the Ganges valley has been so intensely cultivated that its original vegetation has disappeared and it is now practically treeless. It seems probable that this lowland was once covered with open forests of the savanna type. Very different are the Sundarbans, the tidal forests covering the delta, whose impenetrable jungles, mingled with mangrove swamps, have hitherto defied Man's attempts at cultivation.

In the Ganges Plain crops are many and varied. The lower part of the valley, where the rainfall is extremely heavy, is the leading producing area in the world for both rice and jute. Two or even three crops of rice are grown on the irrigated lands, but so great is the demand that, as in similar regions in other parts of India, there is little surplus for export. Jute thrives on the marshy lowlands. Sown in March or April, it is ready for cutting in July. The tough, fibrous plants are first retted and then crushed. After the fibre has been spun it is woven into a coarse cloth used chiefly for making bags and sailcloth. In the *Doab*, the district lying between the Ganges and the Jumna, where much large-scale irrigation is carried on, wheat is the principal cool season, and sugar-cane the chief rainy season crop. India grows more sugar-cane than any other country in the world, but the quality is not very high and the bulk of the crop is consumed in the country.

Calcutta (1½ millions), some 80 miles up the Hugli distributary of the Ganges, the rival of Bombay, is the second largest city in the British Empire. It is linked by rail with all parts of India. From Calcutta-Howrah lines, with many branches, run up the Ganges valley to Patna, important for rice, near the confluence of the Son and the main stream; past *Benares*, Holy City of the Hindus, standing high on the left bank of the Ganges, and thence to *Allahabad*, placed where the Jumna enters the main stream. From Allahabad a line goes south-west to Bombay, another runs up the valley to *Cawnpore*, with cotton, flour, and jute mills, north-east of which is *Lucknow*. Continuing up the valley the railway from Cawnpore passes through *Agra* to *Delhi* (447,000), the capital of India, standing on the right bank of the Jumna. The fact that it is a great railway junction draws attention to the importance of Delhi as a focal point, almost equidistant from Calcutta, Bombay, and Karachi. The historic city lies athwart that route from the Indus lowlands to the Ganges valley, passing between the Thar Desert on the south and the Himalayas on the north, which was followed by invaders entering India through the north-west passes. New Delhi, the seat of the Government of India, lies some miles south of Old Delhi. During the hot weather (June, 92° F.) many people and officials move up to the hill-station of Simla, 7,000 feet above sea-level (June, 67° F.), beautifully placed on a sharp wooded ridge, looking out on the ravines of the Lower Himalayas.

MANUFACTURE, TRANSPORT, AND TRADE

Manufacturing in the modern sense of the term is, with some notable exceptions, relatively unimportant in India, but this is not surprising in a country where 90 per cent. of the people live in villages and 75 per cent. are engaged in agriculture. For centuries handicrafts have been practised in village homes. Of these simple manufactures, cotton spinning and weaving on hand-looms are the most important, for cotton is the chief fibre crop and *saris* and other garments made from it are universally worn. Silk being a luxury is not so widely manufactured, neither is wool, as warm garments are not required, but the fleeces of the goats and sheep provide coarse wool suitable for making carpets and rough blankets. Other hand-manufactures include the making of pottery and leather goods (water-skins, harness, &c.); shoemaking, and metal working (making and repairing hoes, scythes, brass cooking utensils, &c.). It is interesting to note that potters are numerous in districts where well-irrigation is practised, for they have to make the earthen vessels used on the 'Persian' water-wheels; and that there are more potters in Hindu than in Mohammedan villages, for the Hindu religion forbids an earthen vessel to be used twice to contain food.

The making of cotton goods is also the leading large-scale manufacture. Over a quarter of a million people are employed in the great cotton mills of Bombay. Calcutta is the world's chief *jute* manufacturing centre. One of the main occupations associated with agriculture is the tea industry, in which are employed some 850,000 people, more than half of whom are found in Assam. Others work in sugar and oil (vegetable) refineries, flour mills, and in the great iron and steel works (Tata) at Jamshedpur.

Transport. India's rivers are little used for transport. Though the Indus and Ganges rank among the world's great waterways, they have ceased to carry much traffic since railways traversed their valleys. India is the only large country in Asia with a good system of *roads* whose chief value is as feeders for the railways. Since 1853, when *railway construction* was begun in India, some 43,000 miles of tracks have been laid down. The building of the railways has probably done more than any other factor to create a sense of the unity of India. Study the railway map (Fig. 184). Note how the direction of the chief lines is influenced by configuration. Remember that the

system is most easily grasped if related to Delhi, Lahore, and other great inland centres and to the four great ports of Calcutta, Bombay, Karachi, and Madras.

Air transport is being rapidly developed. Karachi and Calcutta lie on the Imperial Airways route to Singapore, Australia, and New

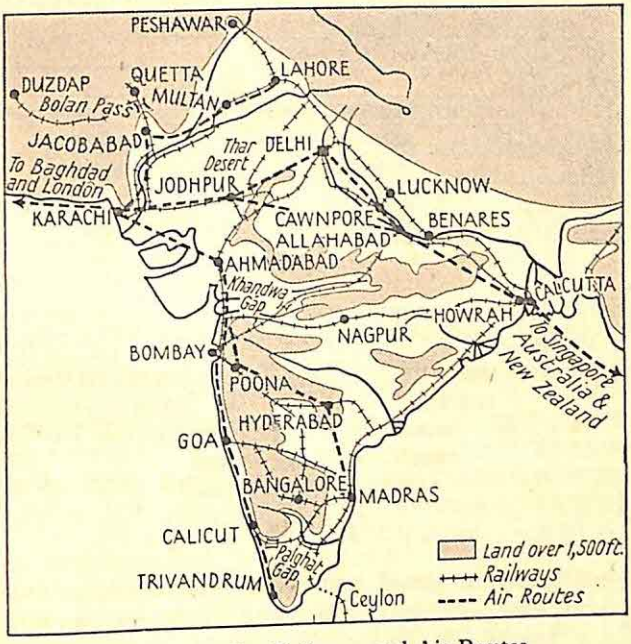


FIG. 184. India: Railways and Air Routes.

Zealand; while internal services link Karachi with Delhi, Bombay, Madras, and intermediate towns.

Trade. The principal exports of India are dependent on agriculture. The chief are raw cotton and unmanufactured and manufactured jute. Almost half the raw cotton is sent to Japan and some to China, Germany, and Belgium, but little finds its way to Lancashire, as it is not well suited for making the high-grade cloths for which that English county is famous. Much of the raw jute is sent to Great Britain (Dundee), but considerable quantities of gunny cloth (coarse sacking) are exported to the United States, while sacks are sent to Australia. Tea ranks third on the export list, the

bulk being sent to Great Britain. Other important exports are oil-seeds, of which Great Britain takes a large proportion, hides, and skins. Unlike Burma, India exports little rice, as most of the crop is consumed in the country.

The bulk of the imports are manufactured goods, a fact which reflects the undeveloped state of manufacturing in India. The chief

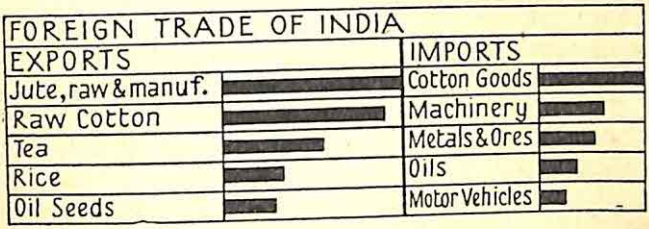


FIG. 185.

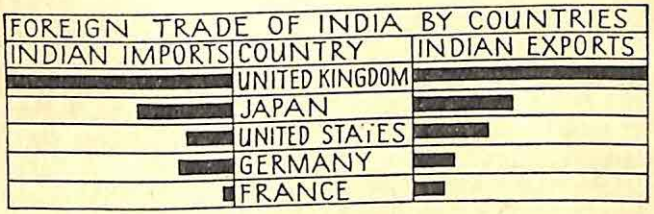


FIG. 186.

are cotton goods imported mainly from Lancashire and Japan; metals, ores, and machinery. In spite of the vast production of sugar-cane, the home supply is insufficient, and a considerable quantity is imported from Java. India imports few luxuries, as the majority of the people, whose average income is little more than sixpence a day, can scarcely find enough money even for necessaries.

India buys about one-third of her imports from Great Britain, who is also her best customer, the trade balance between the two countries being remarkably even. Japan ranks second both as an importer and an exporter. Germany and the United States come third on the import list, but the United States is by far the better customer of India, mainly because she requires a large amount of gunny cloth for wrapping bales. Next in order of importance, both as importers from and exporters to India, are France, Italy, Belgium, and Holland.

EXERCISES

1. India has three seasons. Name them and state their approximate duration. Describe the general weather conditions experienced during *one* of them.

2. (*a*) At what period of the year does the greater part of India receive its rain? (*b*) Name (i) *two* regions with exceptionally heavy rainfall, (ii) *one* with a light rainfall, and (iii) *one* with two rainy seasons. Account for the differences.

3. Why is irrigation necessary in India even in regions with a heavy annual rainfall? Describe the different types of irrigation practised in the country and state the principal areas in which each is carried on.

4. On a sketch-map of India indicate the major Natural Regions. Give a description of *one* of the more important regions under the headings: Relief, Drainage, Climate, Crops, and Towns.

5. Name the four principal ports of India. In the case of each show how geographical conditions have influenced its growth and give an account of its trade. Illustrate your answer by sketch-maps.

6. Name *three* different manufacturing industries of India. For each industry describe the position of the most important centres of manufacture and the geographical factors favourable to it.

7. Write an account of the railways of India so as to emphasize their importance to the country.

8. Describe a journey across the Himalayas. Give reasons for choosing your route.

9. Write an account of the principal trade routes between India and Great Britain, mentioning the chief ports and cargoes concerned. Give a map.

10. Describe the distribution of population in India. Account as fully as you can for the facts you state.

11. *In India the term hut or house covers a variety of dwellings including portable screens of bamboo matting, thatched and mat-walled huts sometimes built on piles and sometimes in trees; the thatched roofed, hog-backed huts of Bengal peasants; those with steeply pitched tiled roofs found along parts of the west coast; and the mud-walled flat-roofed houses of the Punjab.* Account for the type of hut found in (i) Bengal, (ii) parts of the west coast, and (iii) the Punjab.

CEYLON

The Crown colony of Ceylon is about five-sixths the size of Ireland. Lying off the south-east of India, from which it is separated by Palk Strait, the island is splendidly placed almost in the centre of the Indian Ocean. Ceylon consists of a mountainous core surrounded by lowlands which are widest in the north. In structure it resembles the Deccan. The rocks are mainly igneous, but the Northern Plain is composed of limestone, while red laterite soils (locally known as *kabūk*) cover considerable areas in the plains.

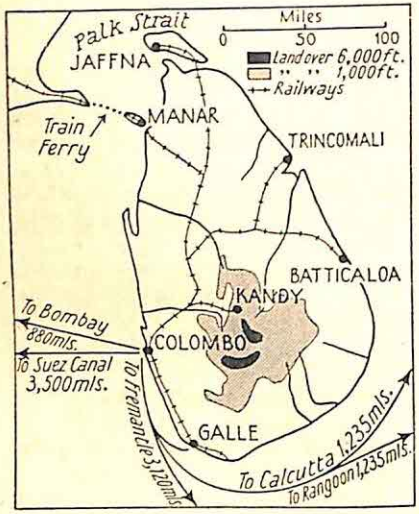


FIG. 187. Ceylon.

Owing to its maritime situation, and to the fact that it lies closer to the equator than India, the climate of Ceylon is more equable than that of its larger neighbour. On the lowlands temperatures are high and both the annual and daily range is small, but the highlands are pleasantly cool. The seasons are determined by the monsoons. The South-West Monsoon (April to September) brings rain to the south-west; the North-East Monsoon (October to March) first to the whole island but later to the eastern side of the hills only. At one time the whole of Ceylon was densely forested, but much has been cleared, and nearly one-fifth of the island is now cultivated.

We may divide Ceylon into two regions: (1) the Mountainous Region; (2) the Coastal Plain.

(1) **The Mountainous Region**—the 'Hill Country'—consists of lofty, much-dissected uplands, whose old hard rocks yield plumbago (graphite). There are numbers of quarries where sapphires, rubies, and other gems are obtained. The swift rivers are useless for navigation, but their waters are used for irrigation, especially in their lower courses. Tea and rubber, Ceylon's chief crops, are grown on

well-watered but well-drained slopes in the south and south-west. The *tea* shrubs, which are planted in rows, do not reach their full yield till their sixth year. Most of the picking is done by women. The two young and tender leaves, together with the bud at the top of each stem, yield the finest tea. India and Ceylon are the leading tea-exporting countries, producing some 70 per cent. of the world's total export crop. Some cacao is grown at elevations between 1,000 and 2,000 feet. *Kandy*, the former capital, situated in the Hill Country, and connected by rail with Colombo, is famous for its Buddhist temples.

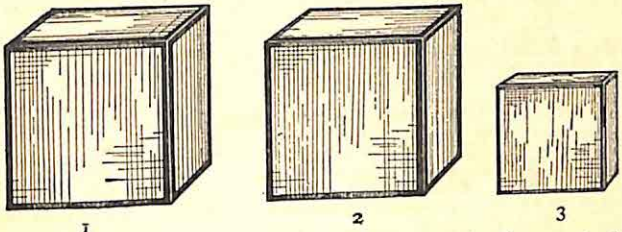


FIG. 188. Comparative Production of Tea from the three principal tea-exporting countries. 1. India; 2. Ceylon; 3. China.

(2) **The Coastal Plain** is widest in the north, where the porous limestone rapidly absorbs moisture from the rains. Much of the land in this area is covered with scrub, and agriculture is limited to areas irrigated from tanks which hold back water from the rains. *Jaffna*, a port, is the chief town of the northern lowland, which as a whole is thinly peopled. *Trincomali*, on a magnificent harbour on the east, lies off the beaten track, but though not commercially important it is a naval and air base.

Apart from the northern district, the coastal plain is well watered and fertile. Both rice—the staple food crop—and coconuts are widely cultivated, especially in the wet south-west. The many coconut plantations yield copra, coconut oil, desiccated coconut and coir, which products rank third in Ceylon's export list. Cinnamon is grown on the sandy soil of the south-west coastlands.

Colombo (284,000), the capital and chief port, is situated in the south-west on a splendid artificial harbour which provides shelter from the South-West Monsoon. Its position makes it an important port of call on the route from Europe, via Suez, to the Far East.

Galle, once the chief port of Ceylon, is now relatively unimportant.

The population of Ceylon is 5 millions. The Sinhalese, the most numerous race, may be divided into the 'Low Country' folk living on the plains in the west and south, and the 'Kandyans', who inhabit the hill country. In the north of the island live descendants of Tamils from Southern India, known as Jaffna Tamils to distinguish them from immigrant Tamil coolies who come from Southern India to work on the plantations. In many of the larger towns the traders are Moormans, descendants of Arabs who married Tamil women. The Sinhalese are Buddhists, the Tamils profess Hinduism, and the Moormans are Mohammedans.

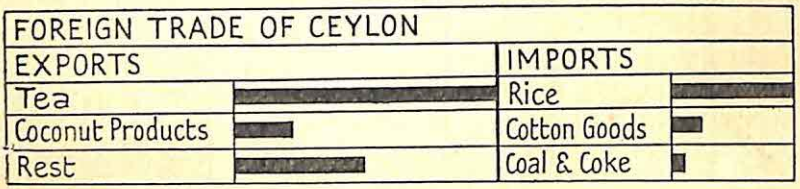


FIG. 189.

EXERCISES

1. Name *three* of the chief exports of Ceylon. Describe the conditions necessary for the large-scale cultivation of *one* of them.

2. Draw a sketch-map to show why Colombo is such an important port. Name *three* other ports in the island.

THE PENINSULA OF INDO-CHINA AND MALAYA

The Peninsula of Indo-China, consisting of Burma, Siam, and French Indo-China, stretches south into Malaya. The following lines of fold mountains run from north to south across the peninsula: (i) the Arakan and Pegu Yoma in Western Burma; (ii) a central range, east of the Shan Plateau, and continuing south through the Malay Peninsula; and (iii) the mountains of Annam, fronting the China Sea. Between the ranges the Irrawaddy, the Salween, the Menam, and the Mekong flow in deep valleys which broaden out towards the sea. In the north-east of this region the Red River follows a south-easterly course to the Gulf of Tongking. With each recurring flood these long swift rivers, carrying enormous loads of sediment, deposit fresh alluvium in their valleys and over their huge deltas.

The *climate* of the greater part of Indo-China resembles that of India. There is a rainy season when the south-west monsoon blows from May to October, followed by a dry period which is most pronounced in December and January. But the eastward slopes of the mountains of Annam and the plains at their base receive rain in the cool season, for they lie in the track of the north-east monsoon blowing across the warm China Sea.

BURMA

Burma, about three times the size of Great Britain, has a population of 14,667,000, the majority of whom belong to the Mongolian race. Most of the people are Buddhists and it would be difficult to find a town or village without its pagoda. Formerly a province of India, Burma became in 1937 a separate state within the British Empire. The country almost coincides with (i) the basin of the Irrawaddy, (ii) the western part of the Shan Plateau; (iii) the middle and lower Salween which crosses the latter area; and (iv) the Sittang valley, and (v) the Tenasserim coast region.

Rice, the chief crop, is widely grown in the deltas and lower valleys of the Irrawaddy and Salween. In contrast to India, quantities are available for export, as far more is grown than is required by the relatively small population. Much of Burma is forested. *Teak*, the most valuable tree, grows in single stands scattered amidst other less useful timber. When a tree is selected for felling, a ring is cut through the bark round its base, thus killing it. It is then left to dry for three years, for otherwise it would be too heavy to float. After the trees have been felled they are hauled to the streams by buffaloes or elephants, and when the flood waters begin to rise the logs are floated down to the main rivers, where they are fastened into rafts which travel down to Rangoon, in most cases a six months' journey distant.

Petroleum, found in the middle of the Irrawaddy valley, is refined at Rangoon; lead and silver are mined in the north of the Shan Plateau, tin and wolfram near Tavoy, on the Tenasserim coast. *Rangoon* (400,000), the port-capital, exports petroleum, rice, and teak, and manufactures imported cotton. From Rangoon a railway runs up the Sittang valley to *Mandalay*, on the Irrawaddy, the chief town of Upper Burma, and on to *Lashio*, the rail-head, and starting-place of the 726-mile *Burma–Yunnan Highway* to Chungking in China.

THAILAND (SIAM)

Thailand, an independent kingdom lying between Burma and French Indo-China and extending southward into the Malay Peninsula, has an area of 198,000 square miles. Its people, about equal in number to those of Burma, are also mainly of Mongolian stock. Rice is the chief crop, the staple food, and leading export. Teak, felled in the forests of Upper Thailand, is floated down the Menam to *Bangkok*, the capital and only large town, connected by rail with Singapore. Tin and wolfram are mined.

FRENCH INDO-CHINA

French Indo-China is about one and a third times the size of France with approximately half its population. It is divided into the colony of Cochin-China, consisting mainly of the basin of the lower Mekong, and four protectorates including Annam, in the west, and Tongking, in the north-east, centring round the lower Red River.

In Lower Cochin-China the Mekong has built up an enormous delta well described as 'the gift of the Mekong'. The river receives the drainage of Lake Tonlé Sap, which during the summer floods acts as a natural reservoir. Important fisheries are carried on in the lake, and also in the rivers and coastal waters. Indo-China has extensive forests. Of the cultivated crops, rice is the chief, but maize, rubber, cotton, tobacco, and sugar are cultivated, as well as mulberry trees (for silkworms). Coal, zinc, tin, and wolfram are mined.

Much rice, and dried and salt fish are exported from *Saigon*, to the east of the Mekong delta, which has rice and saw-mills, and soap factories. There is regular communication by air with Marseilles (6½ days). *Hanoi* (129,000), the capital of French Indo-China, stands on the Red River some distance above Haiphong, the chief port of Tongking.

MALAYA

In the Malay Peninsula lowlands of varying width border the mountainous granite backbone, which is 8,000 feet above sea-level. On the west there is a gradual slope to the mangrove-fringed shores of the Strait of Malacca, but the east coast is bolder, consisting of promontories interspersed with bright sandy beaches.

The peninsula lies in the equatorial wet belt between the Asiatic and Australian monsoon areas. The seasons depend not on tempera-

tures, which are uniformly high, but on rainfall. At Singapore, in the extreme south and almost on the equator, every month is wet,

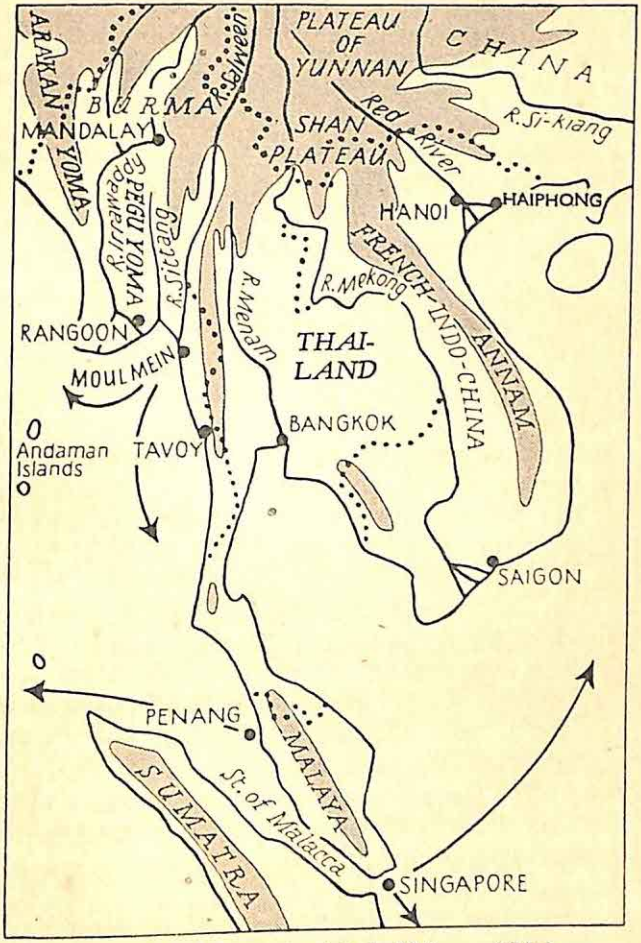


FIG. 190. The Peninsula of Indo-China and Malaya.

but farther north there is, as in India, a wet season from May to October, followed by a relatively dry season. Apart from areas cleared for cultivation or mining, the whole region is thickly forested with an immense variety of trees.

The southern part of the Malay Peninsula is under British control. In 1946 administrative changes were made in British Malaya, and the various units were regrouped to form the *Colony of Singapore*, the Settlements of *Penang* and *Malacca*, which are situated along the west coast, and the *Malayan Federation*, comprising the nine Malay States, each having its own Sultan. The total area of Malaya is approximately equal to that of England. Owing (i) to its mineral wealth; (ii) its uniformly high temperatures and heavy rainfall, which are admirable for rubber and other tropical products; and (iii) its accessibility compared with other equatorial forest areas, British Malaya is by far the most important part of the Indo-China-Malay Peninsula.

The bulk of the world's *rubber* is obtained from plantations in South-East Asia, where British Malaya and the Dutch East Indies are the chief producing areas. Some is also obtained from Ceylon. In Malaya most of the plantations are situated on low hill-sides where the deep soil is well drained to prevent the heavy rainfall clogging the roots of the trees, which are tapped from the fifth year onwards. The latex obtained from them is treated at the plantation factory with acetic acid, which causes it to form a junket-like mass of pure white rubber floating in a clear whey. This process is known as coagulation. The coagulated rubber is passed through the rolling machines, from which it emerges in thin sheets which, after they have been smoke-dried, form the smoked sheets of commerce. Another process produces *crêpe* rubber.

Coconut palms are found throughout Malaya. The chief plantations are on the flat coastal lowlands of the south-west, from which area most of the copra that is exported is obtained. Though much rice is cultivated yet much is also imported to cope with the demand. Most of the British supply of pineapples comes from Malaya. Other crops include sugar, pepper, oil-palms, tapioca, nutmegs, sago, and tobacco.

Malaya supplies about a third of the world's *tin*, most of which is found under the alluvial deposits of the lowlands. Much is obtained by dredging. The leading tin-mining districts are those round Ipoh and Kuala Lumpur. A considerable proportion of the ore is smelted at Singapore and Penang prior to export. Some gold, coal, copper, and iron ore are also mined.

Singapore (500,000), on an island off the coast at the southern end

of the Strait of Malacca, placed at the converging point of trade routes between India and China, and Japan and Australia, is one of the leading seaports in the Far East, an airport on the route to Australia and New Zealand, and a British naval and air base of great strategic importance. It is also a great entrepôt port collecting and exporting rubber, tin, and copra from Malaya, and spices and other products of the East Indies. *Penang*, the second port, also on an island, exports tin and rubber. *Kuala Lumpur* (80,000), the capital of the Federated Malay States, is joined by road and rail to Port Swettenham, on one of the finest harbours in Malaya.

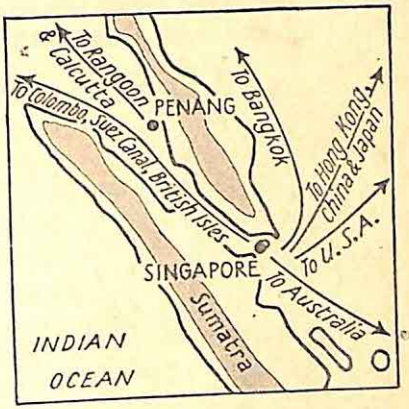


FIG. 191. Site of Singapore.

The Malays, a people of mixed but mainly Mongolian origin, are not particularly good labourers, and much of the work in the towns, the mines, and the plantations is done by Chinese, though Tamils from Southern India are even more widely employed on the rubber plantations.

EXERCISES

1. Write an account of the natural vegetation of the Peninsula of Indo-China and show how it is related to the climatic conditions. Name the chief vegetable products of this region.

2. What geographical conditions are favourable for the large-scale production of rubber? Describe briefly the processes by which it is obtained and prepared for export. Name the two most important producing areas in the world.

3. Draw sketch-maps to show the position of (*a*) Singapore and (*b*) Rangoon. In each case give some account of the trade of these ports.

4. Show how geographical conditions have influenced the industries of Burma.

THE EAST INDIES

The East Indies, lying between the mainland of Asia and Australia, extend from west to east for more than 3,000 miles, or a somewhat greater distance than that from Southampton to New York.

The fold-ranges, running from Sumatra, through Java and the Moluccas, to the Philippines contain along their weakened crests many active and extinct volcanoes. The islands have a present and potential importance as an accessible store-house capable of yielding immense quantities of tropical products.

The climate and products resemble those of the Malay Peninsula. Rain falls throughout the year. It is heaviest and most evenly

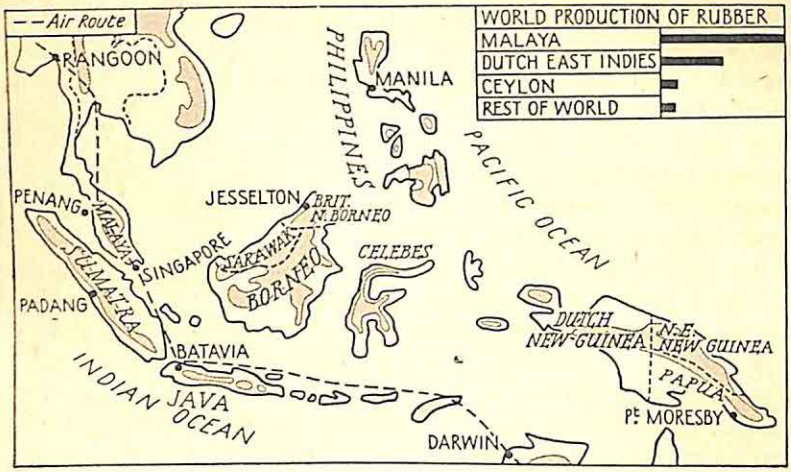


FIG. 192. British Malaya and the East Indies.

distributed near the Equator, while islands farther north or south tend to have wet and dry seasons. All are thickly forested except where land has been cleared for cultivation, or where open woodlands occur at high elevations or in islands with marked dry seasons.

Communications have always been relatively easy. Owing to the successive waves of immigrants that have spread over the islands their peoples are of very mixed racial origin. The Malays, who form the bulk of the population, settled on the lowlands, driving more primitive folk living there into the inaccessible forested interiors, where their descendants—some still head-hunters and tree-dwellers —are still to be found. Portuguese and Spanish conquerors were followed by the Dutch and, later, by the British. In 1899 the United States took the Philippines from Spain, but the latter island-Commonwealth has been promised complete independence in

1945 by the American Government, not unwilling to free itself of its Asiatic possessions.

The *Philippines*, consisting of some 7,000 islands and islets of which the chief are *Luzon* and *Mindanao*, have an area approximately equal to that of the British Isles, and a population of some 13 million. The extensive forests yield ebony, dyewoods, gums, and cedar. From the coconut plantations along the coastal lowlands copra and coconut oil are obtained. The islands rank amongst the foremost countries in the world for coconuts and coconut products. Manila hemp (abaca), sugar-cane, and tobacco are also among the leading exports. Rice is extensively cultivated, but much is also imported. *Manila* (340,000), the capital, on Luzon, has a splendid natural harbour, which affords protection from the typhoons which are frequent in the surrounding seas. It is linked by air with San Francisco.

Part of *Timor* is Portuguese. The north of Borneo and the small adjacent island of Labuan are British, while Brunei and Sarawak are under British protection. The south of Borneo, together with the remaining islands, including Java, Sumatra, the Celebes, the Moluccas, and the west of New Guinea, forms the *Dutch East Indies*.

The densely forested mountainous interiors of both *Borneo*, the largest island in the archipelago, and the Celebes are little explored. Petroleum is obtained from *British North Borneo*, of which Jesselton is the capital; *Labuan* is noted for coal, sago, and pepper. Coal and petroleum are also obtained from *Dutch* Borneo.

Coffee and cacao are grown in the Celebes; nutmegs and cloves come from the *Moluccas*, or Spice Islands. *Sumatra*, the second largest island in the archipelago, is still only partly developed. Rubber, tea, coconuts, and tobacco are cultivated; the mineral wealth includes petroleum found in the north and south, and coal, which is exported from Padang, on the west coast. The development of the east coast is hindered by mangrove swamps. There are rich deposits of tin in the neighbouring islands of *Banka* and *Billiton*.

Of all the islands *Java* is by far the most developed. Together with the adjacent island of *Madura*, it has 51 million inhabitants. Its remarkable development is due to its rich volcanic soil, its climate, the absence of mangrove swamps, and the Dutch genius for organization. The original Malay stock was improved by intermingling with Hindu settlers, with the result that the modern Javanese, are are more industrious than the less mixed Malay type.

A wonderfully intensive system of agriculture is carried on. The hill-sides are terraced up to 5,000 feet, thus allowing the heavy tropical rains to sink into the land, instead of wearing it away and causing disastrous soil erosion. There are coconut and cacao plantations along the coast, and though rice is cultivated everywhere in the lowlands much has to be imported. Rubber, with pineapples planted between young trees, is grown on the foot-hills, and sugar-cane, tea, coffee, tobacco, and maize at succeeding elevations. Then come cinchona trees and open grazing lands, where humped cattle are bred. Outside the volcanic soil areas forests abound: the most important tree is teak. There is also some coal, tin, and petroleum. The principal exports are rubber, sugar, tea, coffee, tobacco, and quinine. *Batavia*, the capital and chief port, lies in the north-west of the island, near Sunda Strait. The bi-weekly air service between Batavia and Amsterdam covers the 8,830 miles in 8 days.

FORMOSA (TAIWAN)

In 1895 Formosa was taken from China by Japan, under whose rule it remained until the end of the Second World War. A rugged forested island, about the size of Great Britain, it lies athwart the Tropic of Cancer and has a tropical monsoon climate. There are heavy summer rains, but the winters are not dry and frosts are unknown in the lowlands. It is one of the chief sources of the world's supply of camphor, which is distilled from the leaves and twigs of an evergreen tree resembling a laurel. Much tea is grown.

EXERCISES.—1. Draw a large sketch-map to show the relative positions of *four* of the most important Dutch East India Islands. Account for the density of population on *one* of these islands.

2. The illustration facing p. 285 shows part of an island in the East Indies. The chief crops grown in the area shown in the photograph are cinchona, coffee, coconuts, maize, pineapples, rice, rubber, sugar-cane, and tea. (*a*) Name *one* reason why the lower slopes of the mountains are terraced. (*b*) Starting with the crop grown at the lowest elevation, arrange the others (named above) in order according to the altitude at which they are cultivated. (*c*) Name *three* of the crops which you think are grown mainly for export. (*d*) Name *one* crop produced chiefly for home consumption. (*e*) In the case of *one* crop only describe briefly the climatic and other conditions necessary for its successful cultivation. (*f*) Suggest, giving reasons for your answer, the name of the island.

3. Summarize, in tabular form, the geography of Malaya, and the British Possessions in the East Indies under the following heads: *State or Island; Natural Vegetation and Crops, Minerals, Towns.*

4. Write a short geographical account of the Philippines.

CHINA

In 1912 the Chinese Empire, one of the oldest Monarchies, became a Republic. The Empire, with an area of four and a half million square miles, included China Proper, now the seat of the Republic; Manchukuo (Manchuria), Mongolia, Tibet, and Chinese Turkestan. Of the outlying territories, Manchukuo and Outer Mongolia claim to be independent states, while much of the rest of China is controlled by the Japanese, who began to invade the country in 1937. Though China Proper is somewhat less than half the size of the former Empire, yet within its borders live three-quarters of the Chinese people, or about one-quarter of the human race.

China Proper. Outside the great alluvial plains drained by the Hwang-ho and the Yangtze-kiang, most of China is mountainous. On the west lofty mountains and plateaux hinder communication with Burma and Tibet. In the north-west, where natural boundaries are not so well defined, the Chinese built their Great Wall, completed two centuries B.C. to protect their country from invaders from the Mongolian steppes.

Most of China lies north of the Tropic of Cancer, whereas much of India lies to the south. This fact, coupled with the absence of a protecting mountain barrier on the north, accounts for the cold winters experienced in Northern China. As the country has a monsoon climate rain falls mainly in summer. It is heaviest in the south, where no month is quite rainless.

Owing to the large amount of mountainous land, all suitable ground is intensely cultivated, and densely peopled by millions of workers, the bulk of whom live in walled towns and villages. In the lowlands the natural vegetation has almost disappeared. Little land is available for pasture, and few animals—apart from draught buffaloes, pigs, and poultry—are reared. Over 80 per cent. of the Chinese depend on agriculture for their livelihood. Farms are small. Most of them are only two or three acres in extent, yet on them is grown enough food to support an entire family. Methods are intensive rather than extensive, and practically all operations are carried on by hand. Little machinery is used; agricultural implements are of the simplest kind, such as wooden ploughs and sets of iron blades of different shapes which the farmer fixes to a bamboo pole according

to whether he wishes to use it as a spade, a rake, or a hoe. There is a remarkable network of *irrigation* canals. Water is usually lifted by water-wheels driven by buffaloes or turned by treadmills worked by man-power. In mountainous districts water is sometimes raised from one canal to another, to a height of several thousand feet. Silt

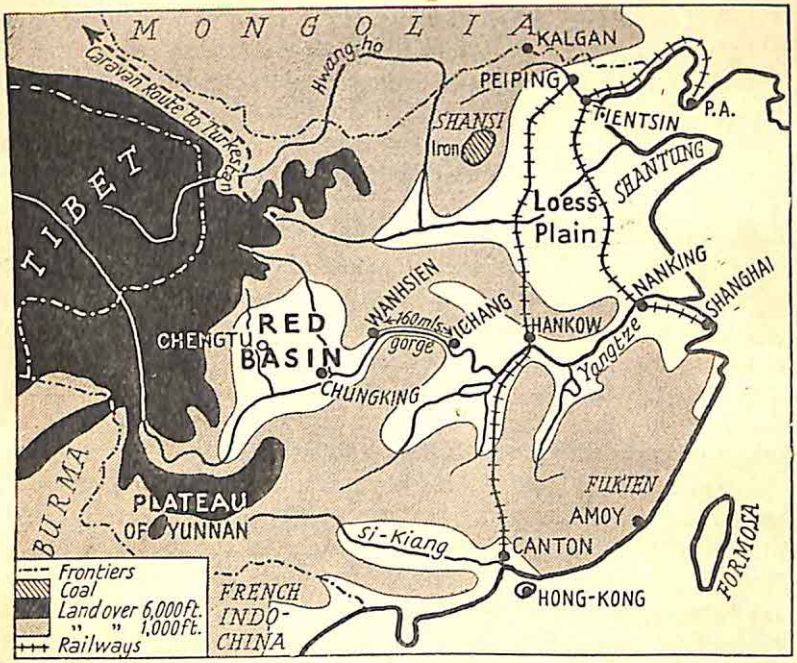


FIG. 193. China.

from the waterways, as well as all other available material, is used to fertilize the land, from which the industrious Chinese wrest, with difficulty, a livelihood. Rice is the staple food crop in Central and Southern China, and millet and soya beans in the drier, cooler north. Cotton and tea are widely grown, and in the south mulberry trees (for silkworms).

China may be divided into—(1) Southern China, centring round the Si-kiang; (2) Central China and the Yangtze-kiang Basin; and (3) Northern China, including the plain drained by the Hwang-ho, and the hilly Shantung Peninsula.

Southern China. Southern China is a mountainous region rising to the bleak Tibetan Highlands through the limestone plateau of Yunnan, rich in tin and other minerals. Much of this rocky and rugged hill-country is clad with forests yielding good hard timbers, camphor, wax, and innumerable bamboos. On the east, the mountains border a sunken coast indented by many rias, which form splendid harbours, like that on which stands *Amoy* (234,000), the chief port of Fukien, a famous tea-growing province. But most of the rugged forested interior is unsuited to cultivation, and the people

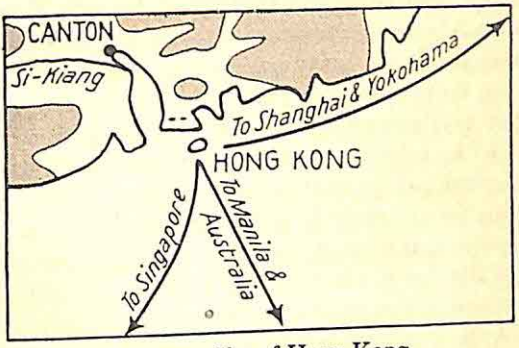


FIG. 194. Site of Hong Kong.

in maritime districts have turned to the sea for their livelihood. Many are fishermen or sea-traders, others are pirates. Some have gone further afield and have settled on islands in the Pacific, in the East Indies, or in the Malay Peninsula, where they work as traders, in mines, or on plantations.

But the hot rainy summers, and relatively mild winters when some rain falls, favour the growth of sub-tropical products, and on the alluvial soils in river valleys, like that of the Si-kiang, much intense cultivation is carried on. Rice, sugar-cane, and cotton are cultivated on the lowlands, tea on the hill-sides. Other crops include oil-seeds and indigo, and mulberry trees associated with sericulture.

The Si-kiang is navigable for nearly 1,000 miles. *Canton* (800,000), the chief town of Southern China, some 90 miles from the sea, stands on the Canton river at the head of the delta built up by the Si-kiang, Pei-kiang, and the Tung-kiang. It manufactures silk, cotton, and woollen goods. South of the Canton river is the Portuguese island of *Macao*, a centre of the opium trade.

The British island of *Hong Kong* lies at the mouth of the Si-kiang river. The territory of the Colony includes part of the mainland opposite. Hong Kong (Victoria) is an important naval station and entrepôt port for Southern China. Its imports include flour, coal, and rice, and its main exports (including re-exports from China) are tea, silk, and cotton. In addition to shipyards, it has factories engaged in rope-making and tobacco manufacture. Tin from Southern China is smelted here, and cement is manufactured.

Central China and the Yangtze-kiang Basin. From its source in the Kunlun Mountains to its mouths in the East China Sea, the Yangtze-kiang measures over 3,000 miles. Its basin, which forms Central China, comprises about one-third of the country containing, within its 700,000 square miles, more than one-third of its entire population. In its upper course the Yangtze is little used for transport, but throughout its middle and lower course it is navigable. Together with its tributaries, and a remarkable network of canals used for irrigation, transport, and drainage, it is the main highway and source of life for the 150 million Chinese living in its basin, or whose homes are junks floating on its waters.

In the Yangtze basin the winters, though cold, are not so extreme or dry as those of Northern China, while the hot rainy summers favour the growth of rice, tea, and cotton.

In its course through China Proper the Yangtze may be divided into four sections: the Red Basin of Szechwan; the Ichang Gorge; the Middle Basin; and the Lower Basin and Delta.

The Red Basin is more than double the size of the British Isles. It has hot summers, but owing to the encircling mountains its winters are milder than most parts of Central China, and frosts and snows are rare. The Kialing, the Min-ho, and other snow-fed streams rising in Tibet are used to irrigate the rich alluvial red soil. Rice is grown on wet lowlands, and wheat, millet, beans, opium, sugar, tobacco, and tea on plains and hill-sides terraced up to several thousand feet. Coal, iron, and copper are mined. Of many walled cities and towns the chief are *Chengtu*, the capital of Szechwan, and *Chungking* (630,000), the principal port, at the confluence of the Yangtze and the Kialing.

The Yangtze is bordered by hilly country from Chungking as far as *Wanhsien* (211,000), at the entrance to the Ichang Gorges, where

the pent-in waters form a series of dangerous rapids extending for 160 miles as far as Ichang.

Below Ichang the river is navigable to the sea, a distance of some 900 miles. From Ichang to Hankow the Yangtze flows through the *Middle Basin*, where it receives a number of tributaries, including the Han from the north-west, and from the south-west the Siang-kiang which carries the drainage of Lake Tungting. In spring huge timber rafts are floated down the latter river, portions being sold at towns *en route*. Every available portion of the alluvial lands of the Middle Basin is intensely cultivated, and the whole country-side looks rather like an unending series of allotment gardens dotted with clusters of huts built of reeds daubed with mud, with here and there walled villages.

The Han flows into the Yangtze at the point where the latter river enters its *Lower Basin*. Here stands the triple city of *Hankow-Hanyang-Wuchang*, whose population approaches 800,000. Though 600 miles from the sea, Hankow is a port for ocean-going steamers. Standing on the recently completed north-to-south railway from Peiping to Canton, it is a great tea market and has cotton, hemp, and flour mills. Hanyang, on the opposite bank of the Yangtze, is noted for its iron and steel works, which are fed with coal and iron from the *Hunan field* to the south. *Nanking* (630,000), the present capital of China, stands farther down-stream. It has a university, an arsenal, and cotton, silk, and paper mills. *Shanghai*, at the mouth of the Yangtze valley, is one of the chief ports and busiest commercial centres in the whole of Asia. It is situated on the so-called Whangpoo River on which stands its outport of Wusung, at the point where the Whangpoo enters the Yangtze estuary. The chief entrepôt port of Central China, Shanghai exports tea, cotton, silk, and egg yolks, while its manufactures include silk, woollen, and cotton goods. Consisting of a crowded Chinese city, an International Settlement, and a French Concession, its population, including its sprawling residential and industrial suburbs, exceeds 3½ millions.

Northern China. Northern China consists of the basin of the Middle and Lower Hwang-ho, the lesser area to the north drained by the Pei Ho, and the Shantung Peninsula to the north-east. We may divide Northern China into (*a*) the mountainous and upland area in the west, (*b*) the lowland plain to the east, and (*c*) the hilly

Shantung Peninsula. Much of this region is covered with *loess*, a yellow soil composed of dust brought by the prevailing winds from Mongolia. Though porous, it is extremely fertile and needs only water to make it bear wonderful crops.

So great an amount of sandy yellow sediment is carried seawards by the Hwang-ho that its very name is derived from the colour of its muddy waters (Hwang-ho = Yellow River), as too is that of the Yellow Sea, into which it formerly poured its silt-laden load. In its lower course the Hwang-ho, flowing slowly over the plain, deposits much sediment on its bed, which, like that of the lower Mississippi, is being continually raised. On occasions the embankments that have been built to keep the stream within bounds burst, and thousands of square miles are flooded, with disastrous loss of life and incalculable material damage. After the waters subside the river may return to its bed, but sometimes it seeks a fresh outlet to the sea. During the last 2,500 years it has changed its course at least eleven times. It now flows into the sea to the north of the Shantung Peninsula, but in 1851 its mouth was to the south.

In Northern China the winters are dry and cold, and strong dust-laden monsoon winds from the north-west blow almost continuously. The bleak and severe conditions have done much to make the northern Chinese a hardier folk than those living in the south. The summers are hot but the rainfall is less than in the rest of China, and in those years when it is insufficient droughts and famines occur. Rice can be grown on the lowlands as far north as the Pei-ho, but the chief crops are of a hardier variety such as millet, wheat, barley, and soya beans. In Northern China millet is the staple food crop. Cotton is cultivated in the Shantung Peninsula, but as it is coarse and short in staple it can only be used for the manufacture of cheap fabrics.

The vast deposits of *anthracite coal* and *iron* in the *Shansi Highlands*, as yet little developed, have hitherto been worked by primitive methods, as too has most of the coal in the Shantung Peninsula, and the iron in Chahar (Inner Mongolia).

From *Peiping* (Peking) (1,556,000), until 1928 the capital of the Chinese Republic, railways run (1) north-east to Moukden; (2) south to Tientsin and Nanking; (3) south via Hankow to Canton; and (4) north-west to Kalgan, whence motor, camel, and coolie transport cross Mongolia, by way of Urga, to Irkutsk (Siberia). The chief

port of Northern China is *Tientsin* (1,292,000), a huge city on the Pei Ho standing at the northern end of the Grand Canal, which runs south for 800 miles to Hanchow. At one time an important waterway, the canal is in part in disrepair and is little used for navigation. Ta-ku is the outport of Tientsin.

Transport and Trade. Lack of adequate transport facilities has played a great part in retarding the development of China. In recent

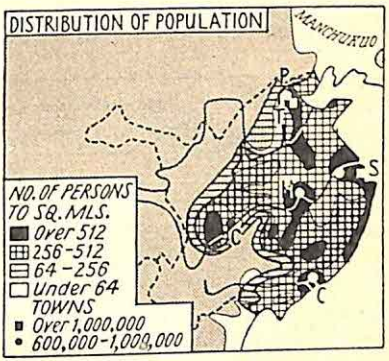


FIG. 195.

years modern roads have been constructed, and at the end of 1935 there were some 12,000 miles of paved roads suitable for motor traffic, but the majority are still mere tracks, often too narrow for vehicular traffic. In the north one-wheeled wagons and carts drawn by donkeys, oxen, horses, and mules are used, but in the main—and especially in the south—land transport is carried on by means of pack animals and by coolies. A great internal trade is carried on over the country roads, and by canals and rivers whose mileage exceeds that of any other country. In the whole of China Proper there are only some 6,600 miles of railway compared with 42,000 miles in India.

Some progress has been made in *air transport*. Among the regular services may be mentioned those from Shanghai (1) to Tientsin and Peiping, and (2) up the Yangtze valley via Hankow and Chungking to Chengtu. Such services are signs of the changes that are taking place in China, but until the road and railway services are more adequate to the needs of the country there appears to be little

prospect of its economic development and an improvement in the material condition of most of the Chinese people.

Owing partly to the low standard of living, and partly to her great and varied resources, China requires relatively little from the outside world. The foreign trade per head is small, though owing to the enormous population the total amount is considerable. About 25 per cent. of the world's supply of raw silk comes from China. Tea, cotton, and animal products (including egg yolks, frozen ducks, pigs' bristles, and camels' hair) are other important exports. A considerable proportion of Chinese produce is sent to Hong Kong for re-

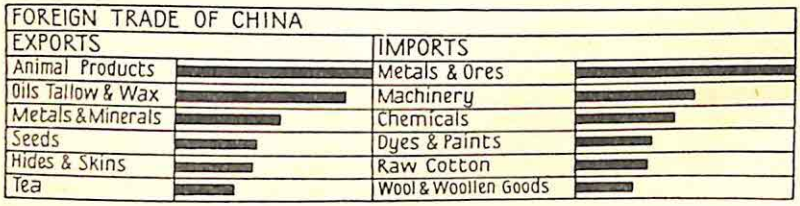


FIG. 196.

export. The bulk of China's import and export trade is carried on with the United States, Japan, Germany, and Great Britain. The export trade of Japan with China has greatly increased in recent years, partly owing to her proximity to her larger though less powerful neighbour.

Manchuria (Manchukuo). In 1932, after a series of military operations, the Japanese seized the Chinese outer territory of Manchuria, together with adjacent provinces in China, and set them up as a nominally independent state under the name of Manchukuo, with its capital at *Hsinking*. The country was liberated after the defeat of Japan in the Second World War. With an area of 500,000 square miles, it has a population—mainly Chinese—of some 43,000,000.

Manchuria has been aptly compared to a lipped bowl, of which the lip reaches the sea on the south and whose rim is formed by the surrounding mountains. Like Northern China, Manchuria has moderately rainy summers and short but very cold, dry winters. In the former season many of the roads are almost impassable: in the latter land transport is comparatively easy. Much of Manchuria is a steppe country, but the north and east are densely forested, and in

spring great timber rafts are floated down the Sungari to lumber mills at *Harbin*, and down the Yalu to those at *Antung* at the mouth of the river.

Millet—characteristic of the drier areas of the monsoon countries—is one of the most important crops, providing the chief food both

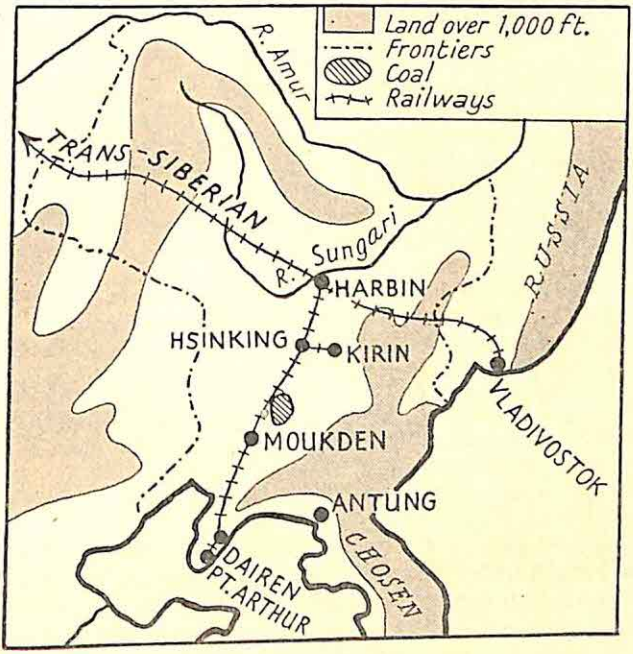


FIG. 197. Manchuria.

for men and animals. Its stems can be used for fuel, fencing, thatching, and making mats, its roots for firing. Southern Manchuria is one of the chief regions in the world for the cultivation of the *soya bean*, whose commercial value has only recently been recognized, though it has been grown by the Chinese for thousands of years, both for food and oil. The country is rich in coal and iron. The chief outlets for Manchuria are the Japanese ports of Port Arthur and Dairen, in the south of the Liaotung Peninsula. Port Arthur is the terminus of the South Manchurian Railway which connects via Moukden and Harbin with the Trans-Siberian Railway.

KOREA (CHOSEN)

Korea was annexed by Japan in 1910, under whose domination it remained until 1945. A mountainous peninsula, it is thickly forested. Crops include rice, millet, tobacco, and beans. Gold and silver are mined. From *Fusan*, a terminal port for Japan, a railway runs through *Seoul*, the capital, to Moukden (Manchuria).

EXERCISES

1. (*a*) Draw a sketch-map of the Yangtze-kiang Basin. On your map shade the high land so as to bring out clearly the *three* chief areas into which the basin may be divided. Mark and name *three* important tributaries and *five* of the principal towns. Indicate the main areas of production of the chief crops and minerals. (*b*) Describe the geography of the basin under the following headings: Relief, Climate, Occupations, and Products. (*c*) Write short notes on *three* of the chief towns in the basin (excluding the seaport which is its outlet).

2. Describe a railway journey from Canton to Peiping, paying attention to the different types of country through which you would pass.

3. Write an account of the chief modes of transport in China and so far as you can relate them to the geographical conditions.

4. What is an entrepôt port? Illustrate your answer by sketch-maps, and describe the position of two of the chief entrepôt ports in or off the coasts of China. Give some account of their trade and show how their growth has been influenced by their situation.

5. Compare and contrast the climate and products of Southern and Northern China.

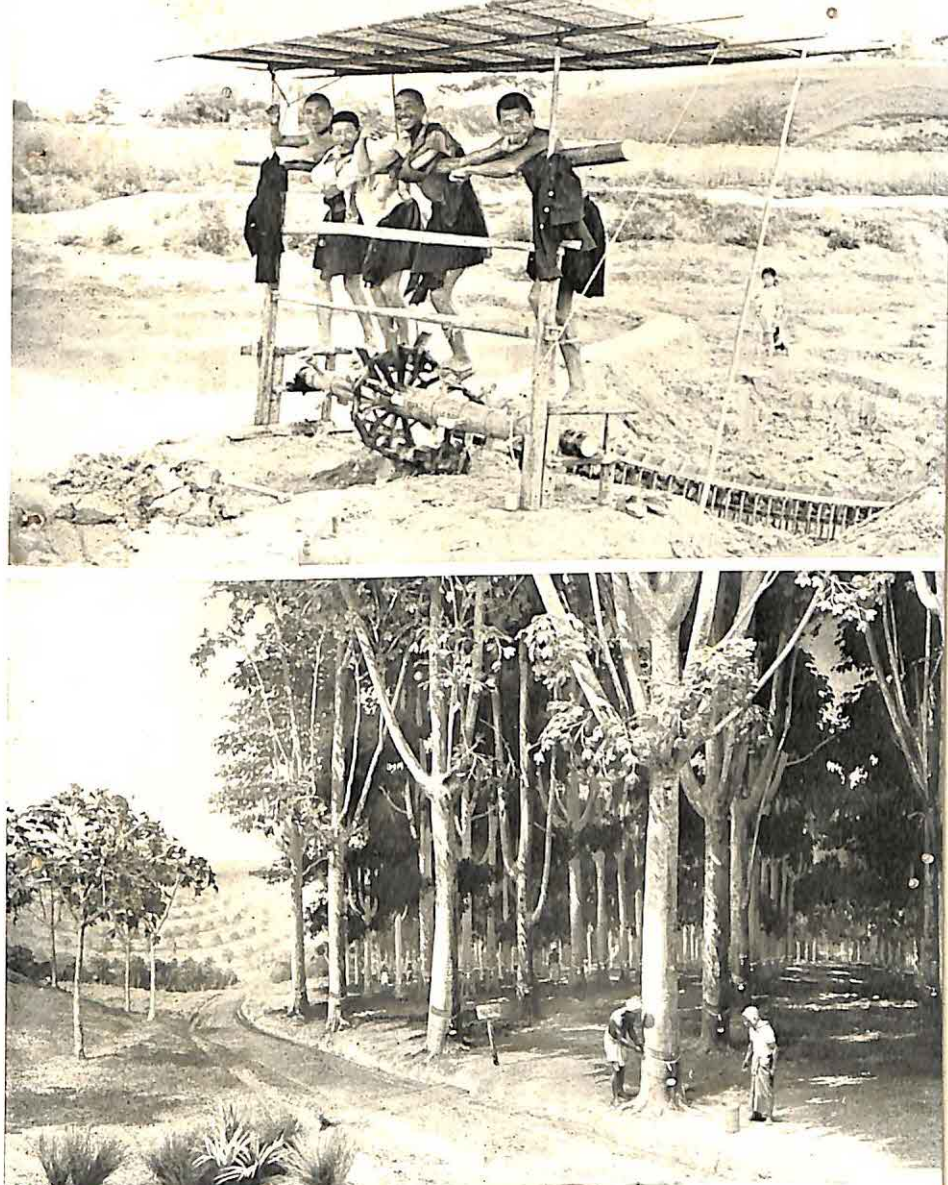
6. Name two important crops cultivated in Manchuria. Describe the conditions necessary for their production on a large scale, and state the chief purposes for which they are used.

7. Draw a map of Manchuria and on it shade the high land, insert two of the chief rivers, print FORESTS over two appropriate areas and the names of *two* important crops each over *one* area noted for their cultivation. Insert and name the capital and *three* other towns, and show *one* important railway.

8. Describe the distribution of population in China and account as fully as you can for the facts you state.

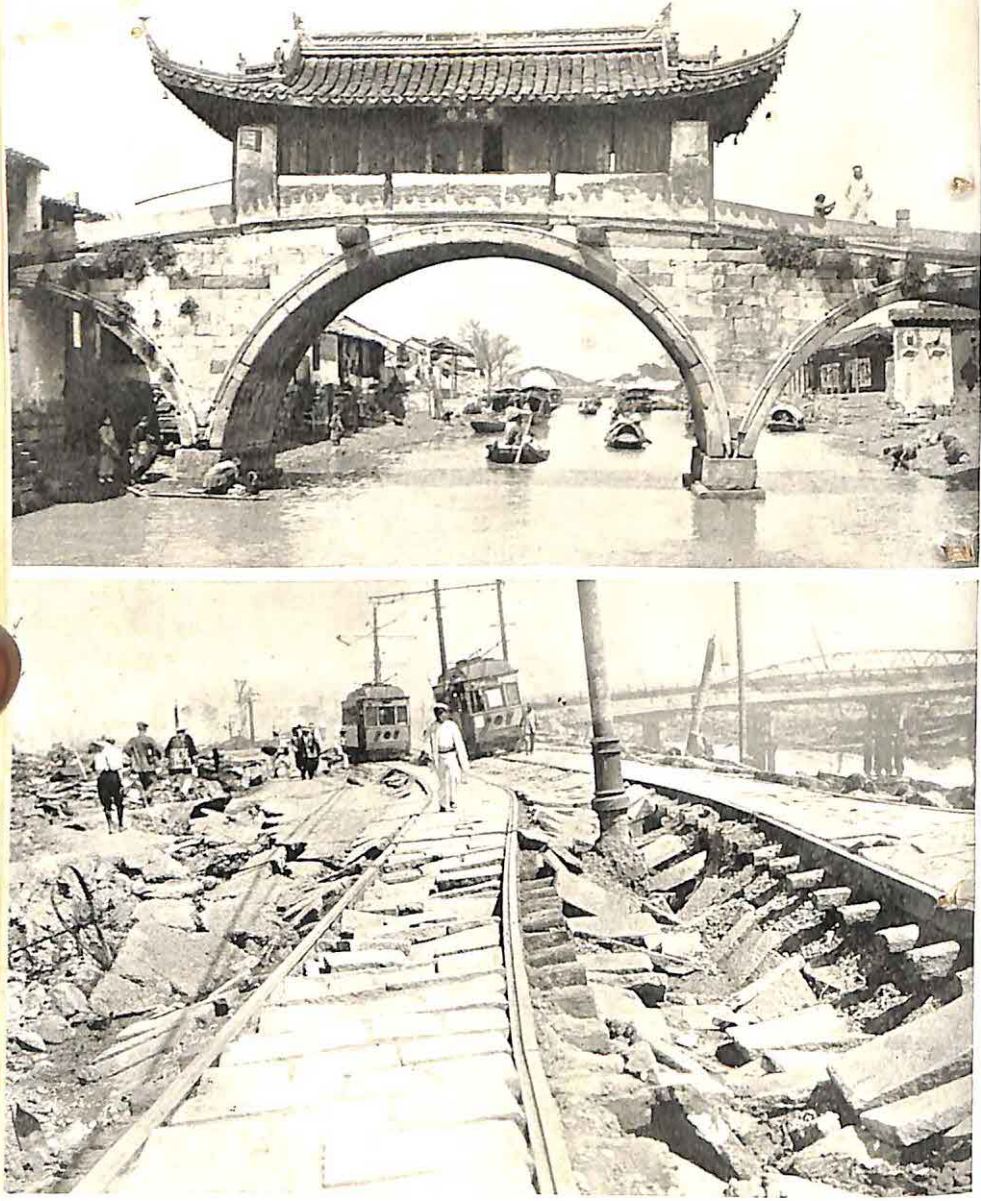
9. What areas would you include in the 'monsoon lands' of Asia? Give reasons for the limits you adopt for the whole tract, and state shortly the geographical conditions that have been favourable to the growth of the population which numbers half mankind.

10. Indicate, by sketch-maps, the position of Canton, Nanking, Peiping, and Hankow. In the case of *two* of these towns, show how their growth has been influenced by their geographical position.



25. IRRIGATION—A RUBBER PLANTATION

(*Above*) Chinese peasants raising water for irrigation by means of a treadmill. There are few large-scale irrigation works in China (see p. 304). Compare India and Egypt. (*Below*) In this rubber plantation in Malaya the coolie has just made a thin incision in the bark of the tree and the latex, which is running down into the cup beneath, will soon be emptied into the pail. Note the 'contour' planting on the hill-side in the background.



26. A CONTRAST

(*Above*) A river near Shanghai. The rivers are the main highways of China. The curved tiled roof of the bridge-house is typical of Chinese architecture (see p. 307). This peaceful scene presents a great contrast to that *below*, where we see an example of the damage done during the earthquake at Tokyo in 1923. Modern structures, such as factories, are now built of reinforced concrete which makes them practically immune from earthquakes (see p. 314).

JAPAN

The Rise of Japan. Three-quarters of a century ago Japan was a little-known country whose people lived in a feudal state resembling that of Britain in the Middle Ages. But the year 1854, when the United States persuaded Japan to open her ports to foreign trade, marked the beginning of a new era. The Japanese began to adopt Western ideas; in 1871 the old feudal system was abolished and a new Japan arose. Advances in the scientific and industrial fields were accompanied by military, naval, and maritime expansion which resulted in territorial acquisitions at the expense of China and Russia. In 1895 the former country ceded Taiwan (Formosa) to Japan, and in 1905, after the Russo-Japanese War, the southern part of the Liaotung Peninsula, together with Port Arthur, passed under her rule. After the First World War Japan was given a mandate over the Marianne, Caroline, and Marshall Islands in the Pacific, which formerly belonged to Germany. In 1932 she obtained control of Manchuria, where she established a dependent state, known as Manchukuo. In 1937 Japan began to overrun China. In December 1941 she entered the Second World War as an ally of Germany. After her defeat in this global conflict Japan was stripped of all her overseas possessions.

It is difficult to estimate the future of Japan, or the part she will play in the affairs of South-East Asia, where formerly she was the most powerful country. The Japanese already have a democratic system of education: no distinction is drawn between the children of the rich and those of the poor, who from the infant school to the university have equal opportunities of advancement. Such a system provides a good foundation for democratic self-government, and the sooner Japan and other nations adopt this form of government the sooner a stable and peaceful world will be assured.

The Japanese Islands. Japan consists of about a thousand small and four large islands which form the nucleus of the country: *Hokkaido*, the most northerly, is a little smaller than Ireland; *Honshu*, or *Mainland*, is approximately equal in area to Great Britain; *Shikoku*, lying south of the Inland Sea, is about as large as Wales, and *Kyushu* is almost half the size of Ireland. The total area of Japan is 147,611 square miles and the population about 70,000,000.

All the islands consist of a mountainous interior surrounded by narrow disconnected lowlands usually crossed by swift short streams, of little use for navigation but valuable as sources of potential and

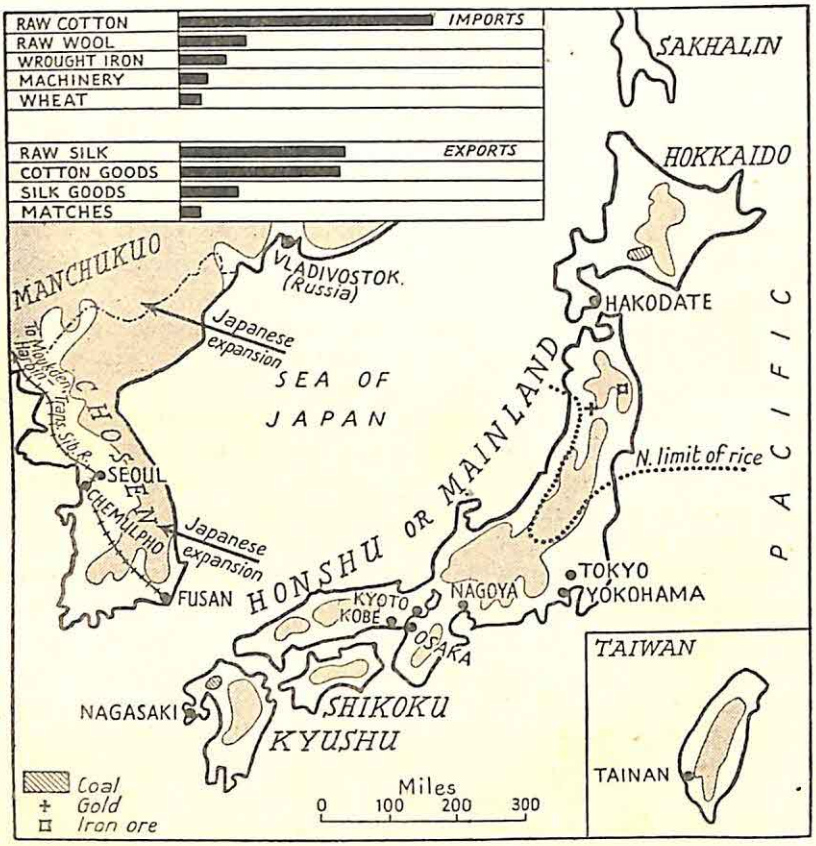


FIG. 198. Japan.

developed hydro-electric power. Of numerous volcanic peaks about fifty are still active. Earthquakes are common, and though the majority are extremely slight some are most destructive, such as that which occurred in 1923, when much of Tokyo and the whole of Yokohama were destroyed. The many excellent harbours around the coasts have played no small part in making the people a sea-

faring race. Much fishing is carried on. Before the Second World War the Japanese had built up a powerful navy, and a mercantile marine whose ships traded with all parts of the world.

Climate, Vegetation, and Crops. Japan has a temperate monsoon climate modified by its insular position, which makes it less extreme than corresponding areas in China. The mountainous interior of the islands and the presence of ocean currents cause climatic differences between west and east. In summer the south-east monsoon winds bring rain to the greater part of Japan, but especially to the south and east. Most rain falls during the latter part of June and early July, when it is beneficial to the newly planted rice crop. In winter the prevailing wind blows from the north-west. At this season the west of Honshu receives considerable rain, but the east coast lands, now on the leeward side of the mountains, have little rain, for the winds (*a*) have lost most of their moisture, and (*b*) blow off-shore in this region. The warm Kuro Siwo current washes the south-east coasts of Japan: the cold Kurile current flows along the east coast of Hokkaido and that of Honshu almost as far south as Yokohama. In the area where the two meet there are frequent fogs owing to the mingling of the cold and warm air. In summer the air over the Kuro Siwo is relatively cool, compared with that over the land, and thus this current has a slight cooling effect along the east coast. In winter, however, when it might be expected to raise the temperature, the off-shore north-west winds minimize its moderating effect. The cold Kurile current helps to reduce the temperatures along the east coast (north of Yokohama) at all seasons. The prevailing north-west winter winds from Siberia also cause the winters in Hokkaido to be very severe. In Japan changes of season are accompanied by violent typhoons which are most dangerous to shipping.

Owing to the range of latitude there are considerable differences in temperature between north and south. In Hokkaido the winters are severe, the summers warm. In Honshu the winters are cold, and severe in the mountains, while the summers are hot, especially in the south. Shikoku and Kyushu have a sub-tropical climate.

Some 60 per cent. of Japan is forest clad, and partly because of this and partly on account of the mountainous nature of the country 16 per cent. only is suitable for cultivation. Deciduous forests, with poplar and aspen trees, and conifers at higher elevations, are found

in the north. In the south are sub-tropical forests with camphor, mulberry, and lacquer trees, as well as innumerable bamboos.

Rice, the staple crop, is extensively grown in the south. Planted in June it is harvested in September before the torrential rains which mark the end of the monsoon. Wheat and barley, sown in autumn often on the same land as rice, are ready for cutting in May. Millet, soya beans, and potatoes are also extensively grown. The poorer peasants live mainly on fish, millet, and barley, as they cannot afford rice. Over a million acres in Japan are planted with mulberry trees for sericulture, for which the warm climate, coupled with the cheap labour provided by the women and children of the peasant farmers' families, makes Japan so well suited that it produces even more silk than China. Tea is widely grown on terraced hill-sides in the south of Japan.

Three-fifths of the arable land is cultivated by peasant proprietors, and the rest by tenants. Few farms exceed 3 acres in extent. With a population of nearly 70 millions in Japan proper, and with so small a proportion of productive land, every available tract is cultivated. The land is tilled with great care, and by dint of hard work, the use of all kinds of fertilizers, irrigation, and terracing, the farmers are able to raise large crops, even though their tools are primitive. Flails are used for threshing, wooden ploughs to till the soil. Wheelbarrows are unknown; earth is carried in a kind of straw hammock slung on a pole between two men's shoulders. Few animals are reared owing to the necessity of utilizing the land for agriculture and also to the unsuitability of native grasses. Both coastal waters and streams are rich in fish.

Minerals, Manufactures, Towns, and Trade. Among the minerals mined in Japan proper are *copper*, *gold*, *zinc*, and *silver*. The two chief *coal-fields* are in the north-west of *Kyushu* and in the south of *Hokkaido*, but the coal is not of so high a quality as that obtained from Northern China, from which area much is imported from mines mainly under Japanese control. Some *iron ore* is mined in the north of Honshu, but the bulk is obtained from Chosen, Manchuria, and Northern China. *Hydro-electric power* is being increasingly developed.

Coal, abundant water-power, and ample and cheap labour have played a great part in stimulating industrial activity. Of all the

manufactured articles cotton goods are the most important, followed by artificial and pure silk goods; wrought iron goods and machinery, pottery, glass, and toys. Fish and fruit are canned for export, and sugar is refined. All the principal cities are situated on Honshu. *Tokyo* (6,000,000), the capital, and the world's third largest town, is the chief commercial centre of the country. Both the modern steel-framed buildings used for industrial purposes, and private dwellings, most of which are built of light wood, are constructed so as to resist earthquakes. *Yokohama* (700,000), the port of Tokyo, imports raw cotton, sugar, flour, and soya beans, and manufactures silk and artificial silk. *Nagoya* (1,000,000), to the west of Yokohama, makes cotton goods, glass, and pottery, and imports raw cotton, rice, coal, and sugar. The town is also a centre of the rapidly developing woollen industry of Japan. Both *Osaka* (3,000,000) and the neighbouring port of *Kobe* (900,000) manufacture silk and cotton goods. *Kyoto* (1,000,000), a short distance inland, the former capital, is a tea market and centre for the manufacture of silk, pottery, porcelain, and lacquer goods.

Hakodate (200,000) is the chief town of Hokkaido. *Nagasaki* in the west of Kyushu, a coal-exporting port and formerly a naval base and ship-building centre, was devastated by an atomic bomb on 9 August 1945.

Owing to the large and rapidly increasing population, the Japanese are unable to grow sufficient food or obtain, within Japan proper, enough raw materials for their manufactures. The policy of Japan, which ultimately led to her participation in the Second World War, was to acquire control of overseas territories which would yield food, raw materials, and markets for manufactured goods. Most of these territories appeared to be unsuitable for settlement by Japanese, and out of some 800,000 who lived abroad before the Second World War over 60 per cent. resided in the United States and only 33 per cent. in other parts of Asia. By increasing her manufactures Japan aimed at becoming, like Britain, an important industrial country, and so providing employment for many people and increasing the national wealth. Japan was better placed for trade with densely peopled China than any of her commercial rivals in that country—the United States, Germany, and Britain.

Fig. 198 shows Japanese exports and imports in 1939. Of these cotton goods and raw silk (sent mainly to the United States) were the

chief exports, while raw cotton, from the United States, India, and China, was the leading import. The bulk of Japanese cotton goods found a market in British India, the East Indies, and Siam, where they proved serious rivals to similar goods from Lancashire.

EXERCISES

1. What type of climate has Japan? Compare the climatic conditions in the west of Honshu with those in the east of that island and account for the differences.

2. Give an account of Japan under the following headings: (i) Commercial importance of its position; (ii) Chief occupations other than manufacturing; (iii) Manufacturing industries with chief areas of production, and the geographical factors favouring their development.

3. Show how Japan is dependent upon other Asiatic countries for (*a*) raw materials; (*b*) food supplies; (*c*) markets.

4. Select *three* of the chief ports and *one* important inland town in Japan, and in the case of each show how geographical conditions have helped to make it important. Illustrate your answer by sketch-maps.

5. How do you account for the frequent earthquakes in Japan? In what kind of physical areas do you expect earthquakes to occur? Name *three* other areas—each in a different continent—subject to these phenomena.

CHAPTER XIX

THE ASIATIC MEDITERRANEAN LANDS

THE chief Asiatic Mediterranean countries are Turkey, Syria, and Palestine. The typical Mediterranean climate is chiefly confined to the coastal areas, but generally speaking throughout this region the summers are hot, dry, and sunny, while nearly everywhere some winter rain falls, the amount diminishing with increasing distance from the Mediterranean.

Vast stretches consist of arid lands where sheep, goats, camels, and horses are grazed. In the better-watered districts autumn-sown cereals, like wheat, barley, and millet, derive enough moisture from the winter rains to be grown without irrigation; and olives, usually found on rocky hill slopes, and vines do not need artificial watering. But citrus and other fruits, cotton and tobacco, all require irrigation.

TURKEY

Turkey is now a relatively small country, about three times the size of Great Britain, with a population little more than one-third as great. Of her once vast possessions there alone remain to her: (*a*) the peninsula of Asia Minor and (*b*) her small European territory. But since Turkey became a republic in 1923 her progress has been rapid. Modern educational methods have been introduced and women have equal rights with men. In many areas farming is now carried on in a scientific way, and though buffaloes and oxen are still widely used for transport and draught purposes, they are gradually being replaced by modern machinery.

Turkey (in Asia) may be divided into (1) the Plateau margined by fold mountains and (2) the Coastal Plains.

(1) *The Plateau* rises from 3,000 feet in the west to 6,000 feet in the Armenian and Kurdistan Highlands. The rivers, flowing in deep gorges, are useless for navigation and difficult to dam for irrigation, though, near Ankara, the Culuk Dam has been built to store water for this purpose and for power. The mountain rim, acting as a barrier to oceanic influences, makes the climate of the interior extreme and dry. No traveller can fail to be impressed by the aridity of the Plateau. Some areas are little better than deserts,

others consist of poor steppes on which sheep and goats are grazed. The famous Angora (Ankara) goats yield a fine curly wool, called mohair, which is an important export. Crops grown in the better-watered areas include wheat, barley, opium, and sugar-beet. *Ankara* (125,000), centrally situated on the Plateau, has replaced Istanbul as the capital of Turkey.

(2) *The Coastal Plains*, nowhere very wide, margin the Black, Aegean, and Mediterranean Seas. The Black Sea slopes of the Pontic

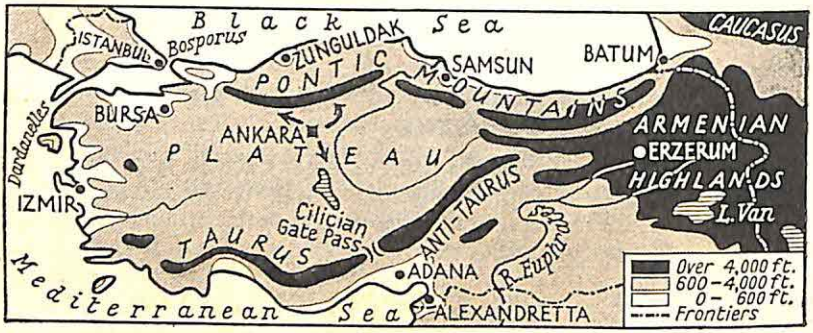


FIG. 199. Turkey and Trans-Caucasia.

Mountains are forested, the hazel bushes yielding nuts for export. Cereals and figs are grown on the plains, and also tobacco, exported from *Samsun*, at the foot of the Pontics, and the capital of a province which suffered much in the earthquake of January 1940.

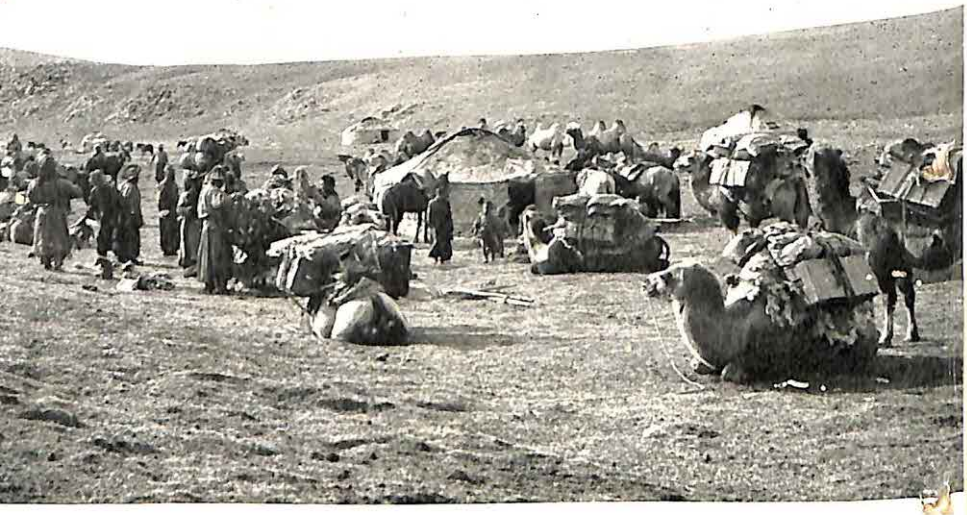
Similar crops, as well as olives and grapes, are grown in valleys opening to the Aegean, such as those watered by the Menderes and the Gediz, both of which converge on the port of *Izmir* (Smyrna). Silk-worm culture is carried on in valleys opening to the Sea of Marmara, where *Bursa* is the chief centre. In most districts the Taurus rise steeply from the Mediterranean, but where they recede from the sea, as in the Cilician Plain, cotton and tobacco are grown. Coal is mined at *Zunguldak*, on the Black Sea. In 1939 Hatay, or the Sanjak of *Alexandretta*, was ceded by France to Turkey.

TRANS-CAUCASIA

To the north-east of Turkey are the mountainous Trans-Caucasian states of *Armenia*, *Aberbaijan*, and *Georgia*, all of which form part of Soviet Russia. The mountains are forested, valleys like that of

27. TRANSPORT: ANCIENT AND MODERN

(*Above left*) Camels crossing a stream near Teheran (see p. 326). Such caravans, still following the ancient desert routes, provide a great contrast to the six-wheeled motor-car (*below*) which is used on the trans-desert route from Baghdad to Damascus (see p. 325). (*Above right*) Primitive boats on the Tigris—shukhturs and ghufas. The round ghufas are made of a wicker framework covered with hides which are daubed with pitch to make them waterproof



28. LIFE IN CENTRAL ASIA

(Above) Ploughing with yaks in Tibet. The village in the background stands in a strong defensive position on the hill-side (see p. 329). (*Below*) A Mongul encampment on the steppes of Central Asia. The nomads are pitching their *yurts*, made of felt stretched over a light framework of poles, that lend mobility to their migrations.

the Kura are cultivated. The railway and pipe-line from the petroleum centre of Baku, on the Caspian, follow the Kura valley to Tiflis and thence to the Black Sea port of Batum.

SYRIA, PALESTINE, AND TRANSJORDAN

This region stretches from Turkey southward to Arabia and from the Mediterranean eastward to Iraq. Syria and its smaller neighbour Lebanon are independent republics, Transjordan is an independent Arab kingdom, and Palestine is administered by the British. Four well-defined zones may be distinguished.

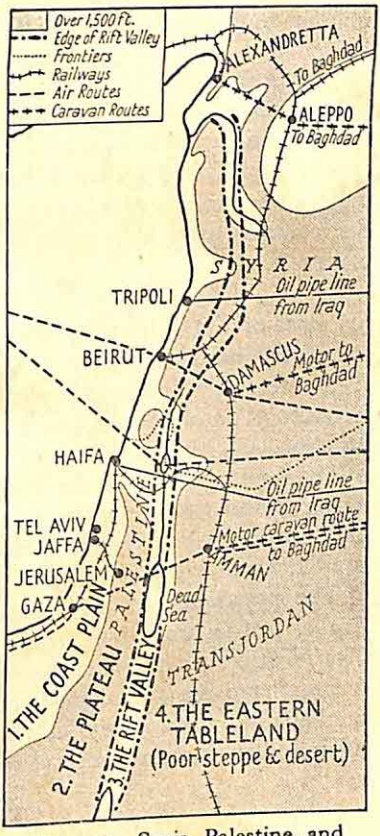


FIG. 200. Syria, Palestine, and Transjordan.

(1) **The Maritime Plain,** bordering the Mediterranean, decreases in width from south to north. The coast, which is rocky in the north and sandy in the south, has few good harbours. Cereals, oranges, grape-fruits, and tobacco are grown on the lowlands, while on terraced slopes are vineyards, olive and mulberry groves. Beirut is the chief port of Syria. Tripoli to the north and *Haifa*, in Palestine, are terminal ports for oil pipe-lines running from Iraq. Since the completion of its new harbour works Haifa has replaced Jaffa as a port. North of the latter is the rapidly growing town of *Tel Aviv*, one of a number of Jewish settlements along the seaboard.

(2) **The Western Plateau.** From the plain the country rises gradually to a limestone plateau broken by hills. Nomadic herdsmen

pasture their flocks on these uplands, but the valleys opening to the Maritime Plain are productive. *Jerusalem*, the historic capital of Palestine, is linked by rail with Jaffa. Its associations with three religions draw pilgrims and tourists from all parts of the world.

(3) **The Rift Valley** is part of that great trough extending from Syria and Palestine, southward through the Gulf of Akaba to the Red Sea, and thence through Africa. In Palestine the valley forms a deep depression drained by the Jordan to the Dead Sea which has no outlet and whose waters, owing to the great evaporation, are so salt that common salt and bromide are obtained from them on a commercial scale.

(4) East of the Rift valley rises the **Eastern Tableland,** which slopes gradually through poor steppes to the Syrian Desert and the Euphrates valley. Wheat is grown round *Aleppo*. *Damascus*, on an irrigated plain on the edge of the desert, is a caravan centre, railway junction, and airport.

The southern part of the Eastern Tableland forms *Transjordan*, a rugged and semi-desert land, inhabited by pastoral Bedouin Arabs and fellaheen who live in scattered oasis-villages. From *Amman*, the capital, a motor caravan service runs across the desert to Baghdad.

The population of Syria and Transjordan are mainly Moslem Arabs, but in Palestine, owing to Jewish immigration since the First World War, there are nearly half as many Jews as Arabs. The former have brought capital and introduced modern agricultural methods into the country, but there is considerable friction between them and their more conservative Arab neighbours.

CYPRUS

The British island of Cyprus, about half the size of Wales, lies some 60 miles from the coast of Syria. Owing to deforestation its limestone hills are now barren and infertile, but the valleys are cultivated. The chief towns are *Nicosia*, the capital, in the centre of the island, and the ports of Larnaca and Limasol.

EXERCISES

1. Treating Syria, Palestine, and Transjordan as a whole, indicate on a map the chief natural regions into which this area may be divided. Show how the characteristic occupations in each region are related to geographical conditions.

2. Write an account of Turkey (excluding the European portion) under the headings: Position, Boundaries, Relief and Drainage, Climate, and Products.

3. Select *one* seaboard and *one* inland town from each of Turkey, Syria, and Palestine, and in each case describe its situation and the geographical causes that have contributed to its importance.

4. Describe the position of the chief British possessions in the Mediterranean (excluding Mandated Territories) and discuss the importance of each.

CHAPTER XX

SOUTH-WEST ASIA

SOUTH-WEST Asia, stretching from Arabia north-eastward through Mesopotamia to the Plateau of Iran, is an arid region where cultivation is almost entirely confined to the river valleys. This vast area forms a transitional belt between the Mediterranean lands and Central Asia. The rainfall, as in the former region, is limited to the winter months, but so scanty is the amount that, as in the even more arid lands to the east, irrigation is essential even for the cultivation of cereals.

ARABIA

The Peninsula of Arabia—an ancient crust-block—is a plateau rising steeply from the Red Sea, but sloping more gently to the Persian Gulf and the Tigris-Euphrates valley. Most of the interior consists of desert or poor steppe on which nomadic tribes, migrating according to the season, pasture their flocks. Cultivation and settlement is limited to the seaward margins and to the oases. *Yemen*, in the south-west, which receives some rains from the South-West Monsoon, is noted for its coffee, exported from Mocha. *Oman*, which has a scanty winter rainfall, is noted for dates. *Mecca*, the principal city and birthplace of Mohammed, is linked by motor service with Jidda, on the Red Sea.

Aden, a volcanic peninsula in south-west Arabia, is a British colony, a bunkering and air-force station on the route to the East, and an entrepôt centre. Its area, with that of the adjacent protectorate, is four-fifths that of England. The *Bahrein* Islands, a British protectorate in the Persian Gulf, are noted for pearl fishing and petroleum.

IRAQ

The kingdom of Iraq consists of Mesopotamia together with a strip of desert and poor steppe to the west. The Mesopotamian lowland, watered by the Euphrates and the Tigris, forms a trough between the old crust-block of Arabia and the young fold mountains marking the edge of the Plateau of Iran.

Outside the desert area we may divide Iraq into two regions: (1) the low table-land of *Upper Mesopotamia*, stretching from the Kurdistan Highlands southward to an ancient coastline, running east and west, a little north of Hit (pitch wells) on the Euphrates; and (2) the great plain of *Lower Mesopotamia*, built up of sediment brought down by the Euphrates and Tigris, whose united lower course, the Shatt-el-Arab, is steadily pushing its delta into the Persian Gulf. In spring (March to May) the rivers, swollen by melting snows from the Armenian and Kurdistan Highlands, roll across the plain in heavy flood. In places, as at Hindiya on the Euphrates, barrages have been built to hold back the flood water for irrigation. In other districts where the now embanked rivers have raised their beds above the level of the surrounding land, inundation canals, somewhat similar to those of the Punjab, are led off from the main stream. But much water is raised by old-fashioned water-wheels and modern petrol pumps. In the time of the Babylonian Empire, Lower Mesopotamia was intersected by innumerable canals, but owing to neglect both before and during centuries of Turkish rule the great irrigation works fell into decay and most of Mesopotamia reverted to desert. Since Iraq has been freed from Turkish rule some progress has been made, but even to-day the population is less than one-quarter that of Egypt, which also depends for its prosperity —in fact, its existence—on irrigation from a great river.

Wheat and barley are grown as winter and cotton and tobacco as summer crops. Dates, the chief export crop, come mainly from the gardens along the riverain belt of the Shatt-el-Arab and the lower Euphrates.

There is an *oil-field* south of Khanaquin and another round Kirkuk, whence petroleum is pumped through pipe-lines to the Mediterranean ports of Tripoli (Syria) and Haifa.

From *Basra*, the chief port of Iraq, river steamers can ascend the Tigris to Baghdad; but the railway first swings up the Euphrates valley and then past the ruins of historic Babylon to the capital. From time immemorial *Baghdad* has been a focus of caravan routes connecting the Persian Gulf and the Mediterranean by way of the Tigris-Euphrates valley. To-day it is an airport on the Europe-Far East route, is connected by motor service with Damascus and Ammam, and by combined rail and motor service, via Mosul, with Turkey.

THE PLATEAU OF IRAN (IRAN AND AFGHANISTAN)

Shut in on all sides by mountains and lying in the north-east trade wind desert belt, the Plateau of Iran is very dry and its climate extreme, with hot summers and cold winters. There is slight winter rain, but precipitation is mainly in the form of snow on the higher mountains. Few streams reach the sea and the greater part of the plateau is an inland drainage area. Politically it is divided into Iran (Persia) in the west, and Afghanistan and Baluchistan in the east.

Iran (Persia), seven times the size of Great Britain, has only some 12 million inhabitants, or somewhat under 20 to the square mile. That alone provides a key to the arid conditions of Iran, nearly half of which consists of sand and salt deserts, so sterile that they do not even provide scanty pasture for flocks. Of the rest of the country, much consists of poor steppes over which herdsmen wander with their flocks of camels, sheep, and goats, whose wool is used for making rugs and carpets of wonderful colouring and delicate design. In irrigated valleys, such as those in the vicinity of the marginal mountains where snow-fed streams provide water, fruits, vines, mulberry trees, barley, wheat, cotton, and tobacco can be grown. Note the position, close to the mountains, of *Teheran*, the capital, situated on a high plain south of the Elburz Mountains; *Tabriz*; and *Isfahan*, in a well-watered valley on the slopes of the Zagros Range.

The district lying between the Elburz Mountains and the Caspian is very different from the plateau. On-shore winds from the Caspian bring rain, which, together with melting snows on the mountains, provides ample water for irrigation.

In Southern Iran there is an important oil-field, in the Karun valley, whence oil is piped either to refineries at Abadan, an island port at the head of the Persian Gulf; or to the river port of Mohammerah, on the Shatt-el-Arab, where it is pumped into tankers. Including the *Trans-Iranian Railway* (completed in 1938), which runs from Bundargaz, on the Caspian Sea, to Bandar-Shapur, on the Persian Gulf, there are about 1,500 miles of rail in Iran. Outside the limited areas so served, communications are carried on mainly by camel and motor caravan.

Afghanistan, the most easterly part of the Plateau of Iran,

stretching towards the slopes of the Hindu Kush and the Pamirs, forms a buffer state between India and Russia. The greater part of this arid country consists of stony slopes, arid plateaus with stretches of rough herbage on which feed fat-tailed sheep, and mountains

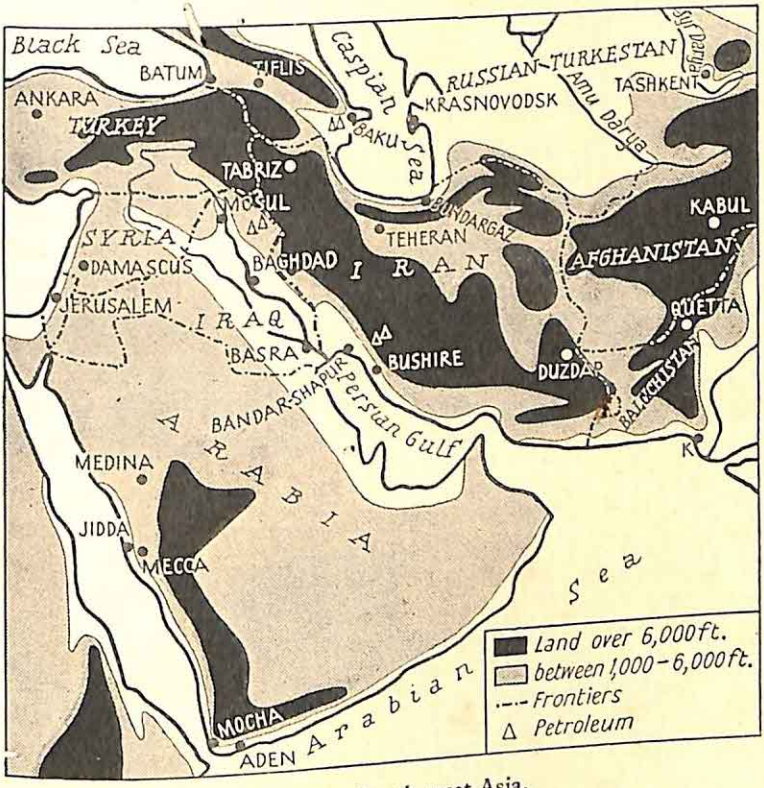


FIG. 201. South-west Asia.

whose snow-clad heights are one of the main features of the landscape. Here and there, in irrigated valleys and plains, are fields of wheat and barley, vegetables, and a variety of fruits including figs, apricots, apples, plums, and cherries. The sheep furnish wool and meat, and the grease from their tails is a substitute for butter.

There are no navigable rivers, no railways, and few good roads.

Goods are carried on the backs of ponies or camels. The most important road is that from *Kabul*, the capital, through the Khyber Pass, to Peshawar in India. Another links Kabul with *Kandahar*, near the frontier of British Baluchistan, whence caravans, with fruit and animals for sale, travel to Quetta, the capital of that Indian province.

29. SIBERIAN SCENES

(*Above*) A typical encampment of reindeer nomads in a forest clearing in Eastern Siberia. I winter the reindeer migrate southward from the tundra, seeking the shelter of the *taiga* in spring, they move northwards again, followed by their owners, towards the Arctic Ocea where camps are pitched during the summer. This photograph was taken in spring (se p. 331). (*Below*) A Gold Dredger on the Vitim River in Eastern Siberia. Each bucket in th dredger is able to lift from 5 to 10 cwt. of gold-bearing 'earth'. Dredging is merely a large scale type of placer mining (see p. 333).

30. THE JORDAN VALLEY

Note the meanders of the river threading its way through the Rift Valley, and the arid nature of the almost impassable country-side, where the barren hill-sides, devoid of vegetation, show the effects of soil erosion.

CHAPTER XXI

THE HEART OF ASIA

CHINESE CENTRAL ASIA

In the heart of Asia, almost surrounded by mountains, is a region, nearly as large as the United States, which, owing to deficient rainfall, is extremely arid and thinly peopled. The summers are extremely hot, the winters cold. This is Chinese Central Asia, which is divided into three huge territories, Sinkiang (Chinese Turkistan), Inner and Outer Mongolia, and Tibet.

Sinkiang, an arid plateau lying between the Altai Mountains and the Kunlun, is divided into two regions by the Tien Shan, the more southerly forming the *Tarim Basin*, drained by the rivers Kashgar and Yarkand, which form the Tarim, to Lake Lop Nor. Much of Sinkiang consists of sand dunes and poor steppes which provide grazing for camels, sheep, and goats. On irrigated lands in the Kashgar and Yarkand valleys, and in other cases situated where snow-fed streams descend from the mountains, cereals, vegetables, and fruits are grown. In such oases stand ancient cities, like Kashgar and Yarkand, which form market centres and links on east to west caravan routes between China and South-West Asia.

Mongolia. The greater part of Mongolia consists of the Gobi Desert, but in spite of its arid nature enough rain falls on its margins to provide pasture for camels, sheep, goats, and horses. Inner Mongolia is still under some measure of Chinese control, but Outer Mongolia, whose chief town is *Urga*, is now a state under the influence of Soviet Russia.

Tibet. South of Sinkiang is Tibet, the loftiest plateau in the world, lying between the Kunlun Mountains and the Himalayas. Owing to its great elevation (14,000 to 17,000 feet) the climate is severe. Much of the country is barren desert, but there is some rough pasture in the south where hardy cereals and fruits are cultivated in irrigated valleys. Not only are sheep and yaks the chief transport animals, but their skins provide materials for clothes, their coats yield wool, their flesh is eaten, and their milk is made into butter, an important article of diet in this cold country. *Lhasa*, the capital, in a tributary valley of the Brahmaputra, is the residence of the Dalai Lama, the head of the government. The chief minerals

are gold, borax, and salt. Caravan trade is carried on with China, from which much tea is imported, and with India over lofty passes.

SOVIET CENTRAL ASIA OR RUSSIAN TURKISTAN

Soviet Central Asia, with an area of over a million square miles, stretches from the Caspian to the slopes of the Pamirs and the Tien Shan. Lying far from the ocean, this huge region has a scanty rainfall, and depends for its water mainly on snow- and glacier-fed streams rising in the ranges to the south and south-east. Chief among such streams are the Amu Daria and the Syr Daria flowing into the Aral Sea, whose valleys, with that of the Zeravshan, are the chief cotton-growing area in the U.S.S.R. Between 1934 and 1940 new irrigation schemes enabled the cultivated area to be trebled, but, in order to save unnecessary transport, the bulk of the cotton, formerly sent to mills at Moscow, is now manufactured at *Ferghana*, *Ashkhabad*, and *Tashkent* (490,000) the largest city in Soviet Central Asia. Oil-fields have been developed at Ferghana and *Bukhara*, which, like *Samarkand*, stands in the valley of the Zeravshan.

Large non-ferrous metallurgical works, which have been established recently, include a poly-metallic combine at *Chimkent*, and a copper refinery at *Pribalkhash*, which uses copper mined north of Lake Balkhash, and coal from the *Karaganda Coal-field*, one of the newest industrial regions in the U.S.S.R. The Turksib Railway runs from Novo-Sibirsk, on the Trans-Siberian Railway, through Chimkent and Tashkent to Ashkahbad, and thence to Krasnovodsk, on the Caspian.

EXERCISES TO CHAPTERS XX AND XXI.

1. Describe the Tigris-Euphrates valley under the headings: (i) Relief, (ii) Climate, (iii) Methods of irrigation and chief crops, (iv) Other important products, (v) Modes of transport, (vi) Chief towns.

2. State in what parts of Asia the camel and the yak are used for transport and similar purposes. In both cases describe (i) how the animal is adapted to the geographical conditions, (ii) the kind of work it performs, and (iii) any useful products obtained from it.

3. Give some account of the occupations of the inhabitants of the Plateau of Iran. With what products does this region supply the outside world?

4. Compare Soviet Central Asia (Russian Turkistan) with Sinkiang (Chinese Turkistan) under (i) Agricultural Activities, and (ii) Transport. How do you account for the greater development of the former region?

CHAPTER XXII

SIBERIA

Most of us have some idea of the enormous size of Russia, but how few of us realize that Siberia alone is considerably larger than Europe. Yet this vast territory stretching from the Urals to the Pacific, and from Turkestan and Mongolia north to the Arctic Ocean, has only a small population. Like Canada, which lies in the same latitudes, Siberia has a continental climate, though one of a somewhat more extreme type than that of the Dominion. The summers are warm, except along the Arctic coast, but the winters are intensely cold. Most rain falls during thunder-storms in the summer months, but though the total amount is relatively small the winter snows compensate in some measure for this, notably in the forest belt, where they lie to a depth of several feet.

Western Siberia, extending from the Urals to the Yenisei river, is a continuation of the Great European Plain. *Eastern Siberia*, like the Canadian and Baltic Shields, is one of the oldest parts of the earth's surface. Rugged and mountainous, it is a huge much denuded area of ancient (Precambrian) rocks intersected by rivers flowing in precipitous valleys. Between the Yenisei and the Lena is a low plateau, east of which the land rises steadily to the Yablonoi and other ranges of the North-East Highlands.

We may divide Siberia into three well-marked natural regions: the Tundra, the Cold Forest Belt, and the Steppes.

(1) **The Tundra** extend from the Arctic Circle northward towards the Arctic Ocean whose shores are ice-bound for the greater part of the year. For eight months these plains are frozen and covered with snow, but in the brief summer, when daylight is almost continuous, innumerable flowers lighten the dull grey of the mosses and lichens. In spring the ice melts earlier in the upper and middle courses of northward-flowing rivers, like the Yenisei, than it does in their lower reaches, where the water, unable to escape by normal channels, pours over the still frozen tundra, forming marshes and swamps.

The few wandering tribes keep herds of reindeer, which they follow northward in summer towards the Arctic, and southward in winter to the edge of the sheltering forest.

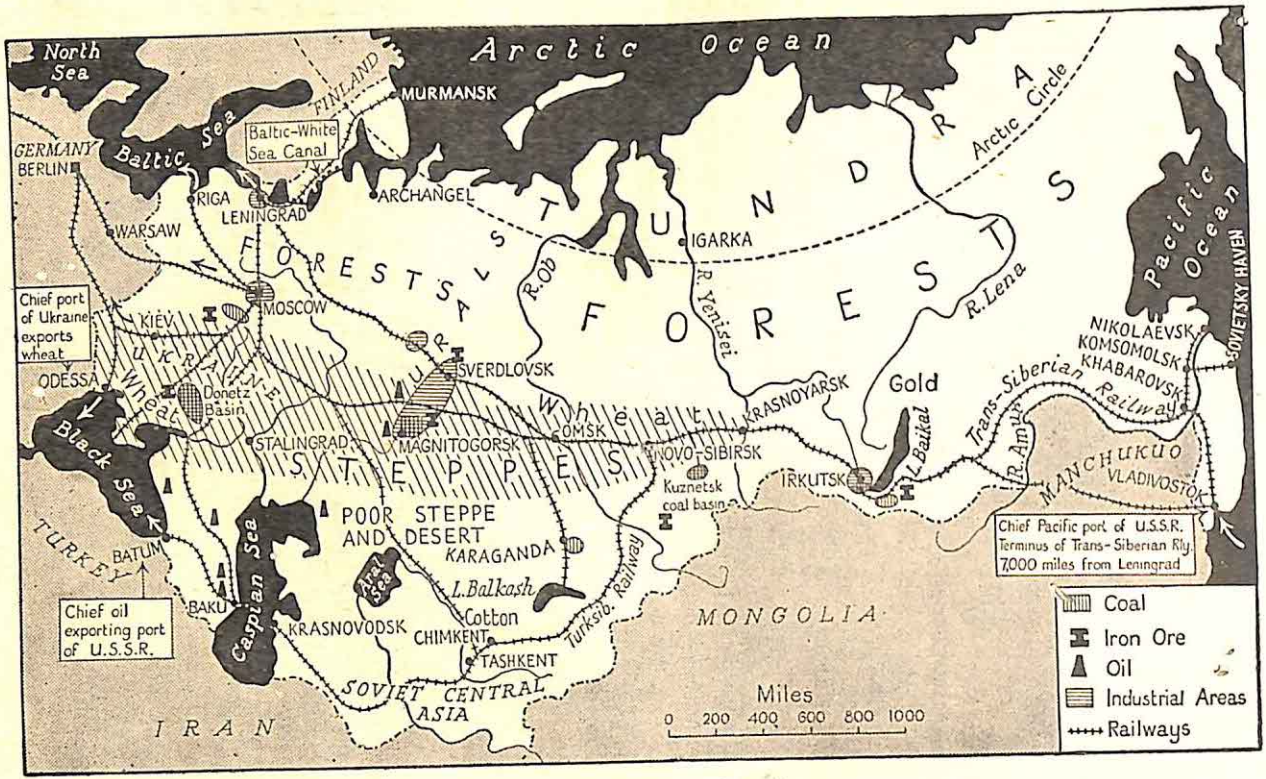


FIG. 202. Siberia: Natural Regions.

(2) **The Cold Forest Belt**, the mysterious *taiga*, lying to the south of the tundra, extends from east to west for over 4,000 miles and from north to south for distances ranging from 1,000 to 2,000 miles. It probably contains about the same amount of marketable timber—spruce, silver birch, and pine—as the Canadian Forest Belt, but as yet, owing mainly to transport difficulties, only some of the more accessible areas on the southern margin, or along such rivers as the Amur, Yenisei, and Pechora (Europe) have been opened up. In late spring and summer, timber is floated down the Yenisei to saw-mills at *Yeniseisk*, or farther down-stream to the new port of *Igarka*, whence in summer months it can be shipped to prospective markets by way of the Arctic.

North of Tobolsk, the old horizontal strata are deeply buried beneath recent deposits, which form an imperfectly drained area where, except in winter, transport is extremely difficult. The ancient bed-rock of Eastern Siberia is rich in gold, coal, iron, salt (near Angara), and other minerals, but with the exception of gold little of this wealth has yet been won. The chief gold-fields are the *Lena Gold-field*, on the Vitim Plateau to the north of Lake Baikal, and the *Aldan Gold-fields* still farther north. But owing to transport difficulties it takes two weeks to travel from Irkutsk to the former field, and an additional week to reach the latter. Throughout the eastern taiga much gold is obtained by placer mining, for thanks to prolonged denudation, particles of gold from disintegrated rocks have been concentrated in the beds of streams. The Urals are also rich in minerals, notably iron, coal, and platinum (see p. 216).

(3) **The Steppes** of Western Siberia lie south of the Forest Belt. In most parts the rainfall, though enough for grasses and cereals, is insufficient for trees. Excellent wheat is grown, but owing to the cost of transporting by rail heavy and bulky commodities like grain, farmers tend to concentrate on dairying, which is now the leading industry. Thousands of tons of butter are dispatched in refrigerating cars to Moscow, Leningrad, and other cities of European Russia. It is a long and expensive journey, but the cost is justified, for butter is in great demand and takes up far less room than wheat of equal value. South of the dairying and wheat belt, where the rainfall is less, the land is in the main only suited for rough grazing.

(4) **Recent Developments in Siberia and the Far East.** Siberia is a territory with enormous possibilities, but until the Soviet

régime little attempt was made at systematic development. This region is served by some of the world's longest rivers, but though the Ob, the Yenisei, the Lena, and the Amur are all navigable, they are frozen for about two-thirds of the year, and only in summer can be used for transport, notably for carrying such bulky commodities as grain and timber.

Many of the older towns, such as *Tobolsk*, at the junction of the Irtish and the Tobol, rose up at confluence points. With the completion of the Trans-Siberian Railway, recently double-tracked throughout its length, other towns became important because they stood where the line crossed a navigable stream, and where goods brought by water could be forwarded by rail or vice versa. Such a town is *Novo-Sibirsk*, on the Ob, the capital of western Siberia, and the junction for the Turkestan-Siberian Railway. However, this town owes its growth in the last few years to the fact that it stands on the margin of the *Kuznetsk* (*Kuzbass*) *Coal Basin*, one of the industrial areas now being opened up in Siberia, whose output is second only to that of the Donetz Basin. Coal is dispatched to the Ural area from which iron ores are brought back to supplement the Kuzbass supplies. During the last decade heavy iron and steel, and light metal and chemical industries have been established, and thermal power-stations erected, in the Kuznetzk Basin. The remarkable development of this region is shown in the increased population of three of the largest towns. In 1900 the population of *Novo-Sibirsk* was only 5,000, in 1936 it was 120,000, in 1940 it had risen to 405,000; the mining centre of *Kemerovo* had 21,730 inhabitants in 1936, and 133,000 in 1940; and the population of *Stalinsk*, the chief iron and steel centre, rose from under 4,000 in 1936 to 170,000 in 1940.

At *Omsk*, on the Irtish, the lines from Leningrad via Perm, and Moscow via Chelyabinsk, unite. Thence after passing through Novo-Sibirsk, the railway runs through increasingly wooded country to *Krasnoyarsk* on the Yenisei, and through a still more rugged and forested region to *Irkutsk* (100,000), on the Angara, whose focal position helped to make it the chief city of eastern Siberia. Rounding the southern end of Lake Baikal the line reaches Chita, beyond which it divides. One branch climbs the Yablonoi Mountains and descends to the Plain of Manchukuo, passing through Harbin to Vladivostok; the other, running entirely through Soviet territory, descends the

Amur Valley to Khabarovsk, and thence to *Vladivostok*, Russia's chief Pacific port, ice-bound in winter. Since 1941 coal and iron mines have been opened up in the lower Amur Valley, and iron and steel industries developed near *Komsomolsk* and *Khabarovsk*, whence a railway runs down the Amur to *Nikolaevsk*, which refines oil brought by tanker from the Russian island of Sakhalin.

EXERCISES

1. Describe a railway journey from Leningrad to Vladivostok, paying special attention to (i) the types of scenery and (ii) the natural resources and economic activities of the regions traversed. Give a map.

2. Illustrating your answers by sketch-maps, give an account of (*a*) the Kuznetzk Coal Basin, and (*b*) the Far Eastern Industrial Area, i.e. the lower Amur Valley.

TEST PAPER: EURASIA

PART I

1. (*a*) What proof is there of the rotation of the earth? Illustrate your answer by a diagram. (*b*) If you were travelling by steamer from Southampton to Quebec you would advance the hands of your watch, but if you were going to Bombay you would put them back. Explain why this is so.

2. Examine the photograph of the Lauterbrunnen Valley (Plate 14). (*a*) What type of valley is this? (*b*) Draw a contour map to illustrate the characteristic features of such a valley. (*c*) What effect does the relief have on the occupations of the people living in the valley?

3. (*a*) What do you mean by the term *map projection*? (*b*) Name a suitable projection on which to draw a map (i) to show directions correctly, (ii) to illustrate the area of the British Empire, and (iii) to represent Ceylon. Give reasons for your answers.

4. The following statistics give the mean monthly temperature and rainfall for three towns, one in Asia, another on the mainland of Europe, and the third in the British Isles. Suggest, giving your reasons, the area in which each is situated, and state the major climatic region to which it belongs. What type of natural vegetation, and what kind of agricultural products, would you expect to find in the district in which each town is situated?

	Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
A Temp. °F.	42	43	44	47	52	57	60	60	56	50	46	43
A Rain. in.	2·3	1·9	1·9	1·9	2·0	2·0	2·6	3·0	1·9	2·7	2·7	2·5
B Temp. °F.	75	75	78	82	85	82	80	79	79	81	79	76
B Rain. in.	0·1	0	0·1	0	0·7	2·1	2·7	1·6	1·2	2·4	0·4	0
C Temp. °F.	52	56	60	64	70	78	85	85	78	68	60	53
C Rain. in.	2·6	2·0	2·6	1·8	1·7	0·6	0	0·1	0·8	2·4	3·1	2·5

5. Name one country where each of the following animals are used for transport or draught purposes: camels, yaks, elephants, reindeer, water buffaloes. Show how any *two* of these animals are adapted to the work they perform.

PART 2

6. Name the chief airports at which you would call in flying from England to Karachi. Describe the relief, climate, and characteristic scenery of the lands over which you pass.

7. (*a*) Divide India into *three* major regions. Give the reasons for your division. Select one of these regions and show how the occupations of the people are adapted to their environment.

8. Name (i) a leading port in the Mediterranean, (ii) an entrepôt port in South-East Asia, and (iii) an inland port in Europe outside the British Isles. Draw sketch-maps to show the position of each port and describe its trade.

9. Select one channel of communication from each of the following groups. Describe the kind of scenery you would see in travelling through it, and suggest the kind of trade that passes along it. (*a*) The Kiel Canal *or* the Manchester Ship Canal; (*b*) the Khyber Pass *or* the St. Gotthard Pass; and (*c*) the Rhine Valley *or* the Dardanelles.

10. What geographical conditions favour (*a*) the development of hydro-electric power in Northern Italy; and (*b*) irrigation in the Yangtze Valley?

PART 3

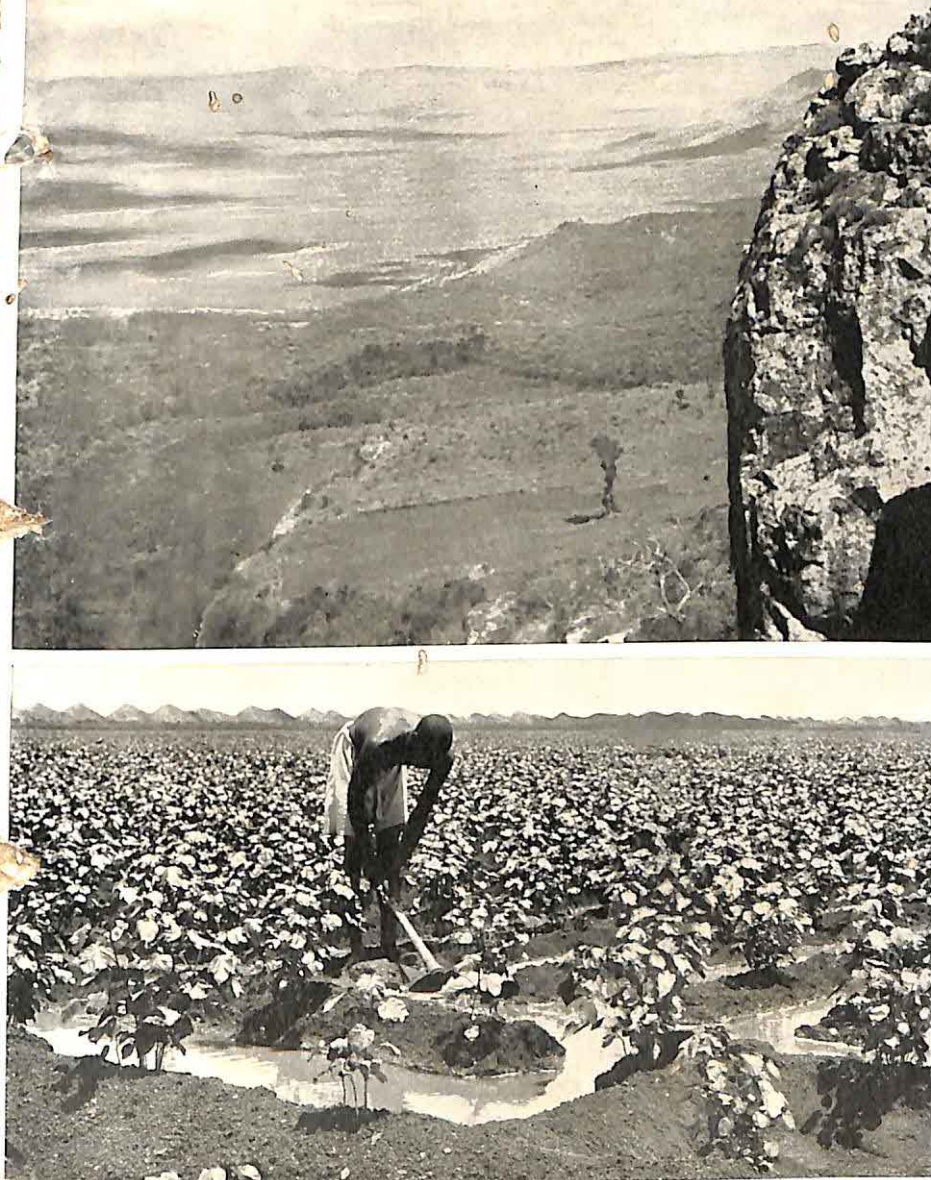
11. 'Railway companies usually establish works at places on their own lines, in central positions, where land is cheap, rather than in the vicinity of the coal- and iron-fields from which they can carry supplies at low cost.' Select two towns in the British Isles which illustrate the above statement, and draw sketch-maps to show their position, in relation to routes, and to the nearest coal-field on the railway system on which they are situated.

12. Divide Scotland into *three* regions. Which is the most densely and which the most sparsely peopled? Show how the relief, climate, and occupations of the people have influenced the distribution of the population.

13. What geographical factors have contributed towards the importance of: (*a*) Aberdeen as a fishing port; (*b*) Blackpool *or* Brighton as a seaside resort; (*c*) the Clyde as a shipbuilding area?

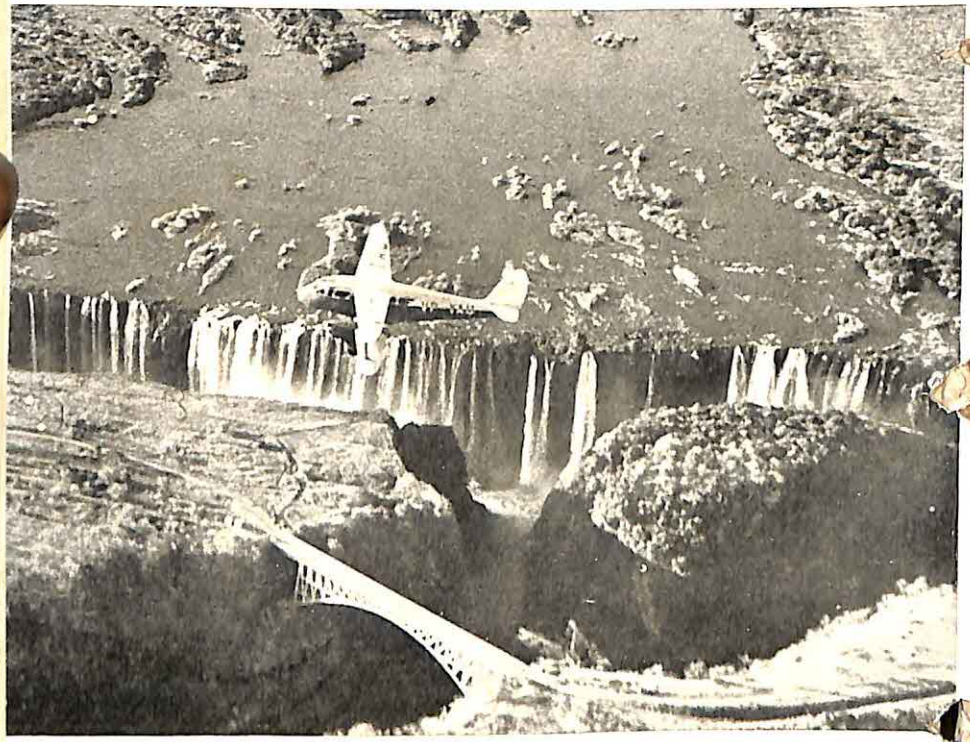
14. Compare the work of a farmer living in Eire with one in the Fens, and account for the differences.

15. Select *two* inland coal-fields in the British Isles. Describe their position, and name the chief industries (apart from coal-mining) carried on. Select *one* industry from each area and state from whence the necessary raw materials are obtained. Illustrate your answers by sketch-maps.



31. THE EASTERN RIFT VALLEY—THE ANGLO-EGYPTIAN SUDAN

(*Above*) The Eastern Rift Valley of Africa viewed from the Elgeyo Escarpment, Kenya (see p. 337). (*Below*) Second watering of cotton plants in the Gezira, the district between the Blue and the White Nile which has been brought under irrigation through the construction of the Makwar Dam. Note that the Sudanese negro is using a hoe, the almost universal implement of agriculture in Tropical Africa.



32. SCENES ON THE NILE AND THE ZAMBEZI

(*Above*) An Egyptian village, isolated by the traditional *basin system* of irrigation which is still widely practised in Upper Egypt, especially above the Aswan Dam. (*Below*) The Zambezi pouring over the Victoria Falls. The bridge carries the railway from Southern Rhodesia to Northern Rhodesia and thence to the Belgian Congo (see p. 363).

PART IV

AFRICA

CHAPTER XXIII

GENERAL SURVEY OF AFRICA

Position and Size. Africa is the second largest continent. Its area is about 11½ million square miles, or approximately two-thirds that of Asia, to which it is joined by the isthmus of Suez, now cut by a canal. In former ages Africa was connected with Europe where now are the straits of Gibraltar and Tunis, the subsidence which caused their formation taking place in geologically recent times. As Africa stretches for approximately 35° on each side of the Equator it is crossed by both Tropics: thus the bulk of the continent lies in tropical latitudes. Owing to its shape the portion north of the Equator is much bigger than that to the south. Africa is compact. Unlike Europe, its coasts are almost unbroken, and though Europe is but one-third the size, its coastline actually exceeds in length that of Africa by some 4,000 miles.

Physical Features. Apart from the Atlas Mountains in the north-west, which form part of the old-world fold mountain system, Africa is mainly a huge plateau rising by steep escarpments from narrow coastal plains. A line, slightly convex towards the south-east, extending from the mouth of the Congo to Port Sudan on the Red Sea, divides the plateau into two regions differing in elevation. The north-west portion is a comparatively low plateau—consisting mainly of the Sahara Desert—crossed from south-east to north-west by the Ahaggar Plateau and the Tibesti Highlands. The south-east consists of a much loftier plateau bordered on its seaward side by mountains that are often higher than the interior. This may be divided into the Abyssinian Plateau, of volcanic origin; the Central Lake Plateau in the middle of which lies Lake Victoria; and the South African Plateau whose eastern edge is formed by the Drakensbergs.

The *Eastern Rift Valley* of Africa is part of that running from Palestine through the Gulf of Akaba and the Red Sea, across Abyssinia, past Lake Rudolf, to Lake Nyasa. From the northern end

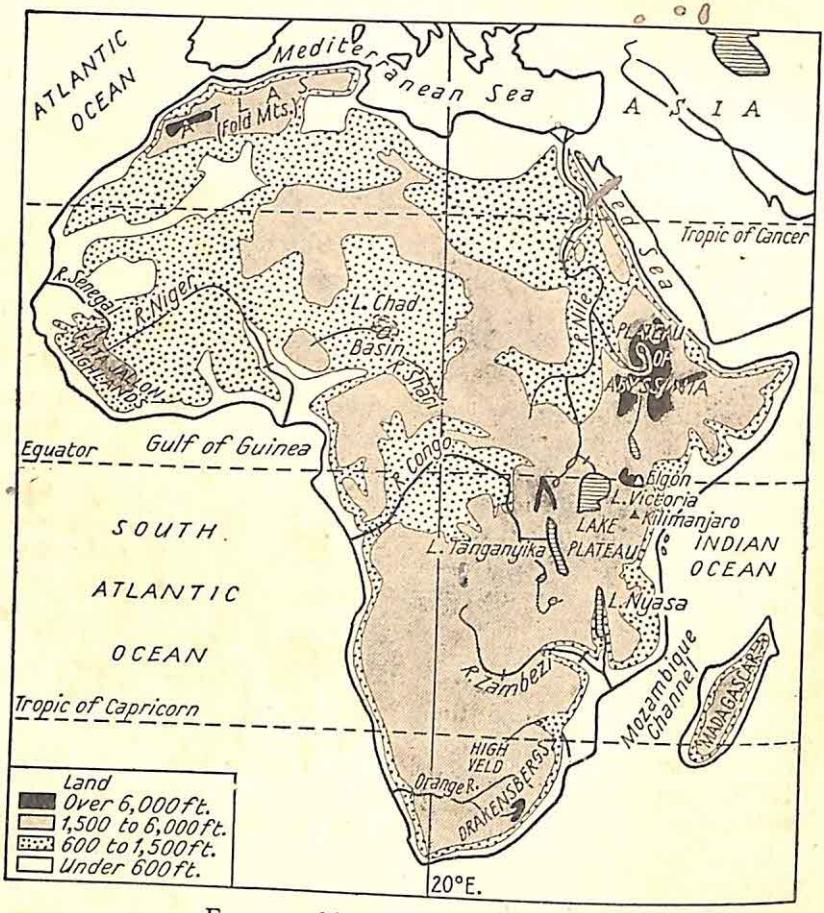


FIG. 203. Africa: Physical Features.

of the latter lake, a branch rift valley runs north-west through Lakes Tanganyika and Edward to Lake Albert. On the east side of the Eastern Rift Valley the extinct volcanoes of Kenya, on the Equator, and Kilimanjaro, some 200 miles to the south, rise to 17,040 and 19,320 feet respectively. Between Lake Albert and Lake Edward the Ruwenzori Range rises to the east of the western rift valley, while south of the latter lake are the Mfumbiro Mountains, with the still-active volcano of Kirunga.

Drainage. The great rivers of Africa are navigable in their courses over the Plateau, but are interrupted by falls where they descend to the coastal plains, and thus are of little use for navigation in their lower courses. Only in the case of the Niger and the Nile are these falls far from the sea; the Nile between Khartoum and Aswan is interrupted by six cataracts at points where belts of hard rock cross the river valley.

The Nile, the longest river in Africa, after emerging from Lake Victoria, flows for some 4,000 miles before it reaches the Mediterranean. Below Berber it traverses a desert region and receives no tributaries. The Congo, 3,000 miles long, drains an area of about 1,500,000 square miles. As much of its basin lies in the equatorial wet belt its volume at certain seasons is much greater than that of the Nile. The Niger (2,300 miles), and the westward flowing Senegal and Gambia, all rise in the Futa Jallon Highlands. The river Zambezi, whose source is not very far from the headwaters of the Congo, has a course of 1,800 miles before entering the Indian Ocean. In South Africa both the Limpopo, flowing into the Indian Ocean, and the Orange, which falls into the Atlantic, are useless for navigation.

About one-third of Africa is an Inland Drainage Region. Lake Chad, into which flows the intermittent Shari, is the centre of a large area of internal drainage lying south-east of the Sahara; Lake Ngami of a similar region in South-West Africa; Lake Rudolf also has no outlet to the ocean.

Climate. Before studying the climatic conditions in detail let us look at a few outstanding factors that influence them greatly.

(1) As three-quarters of Africa lies within the tropics the greater part of the continent is hot, though in many regions, especially in the south-east, the elevation somewhat moderates the actual temperature.

(2) Since the Equator almost bisects Africa we may expect to find

heat, 90° F., is in the south-east. The north is now the coolest part of the continent. The January temperature at Algiers is 53° F., compared with 69° F. (summer) at Capetown (Fig. 205).

In the equatorial belt temperatures are uniformly high throughout the year, and the annual range is small. Notice, however, that, owing

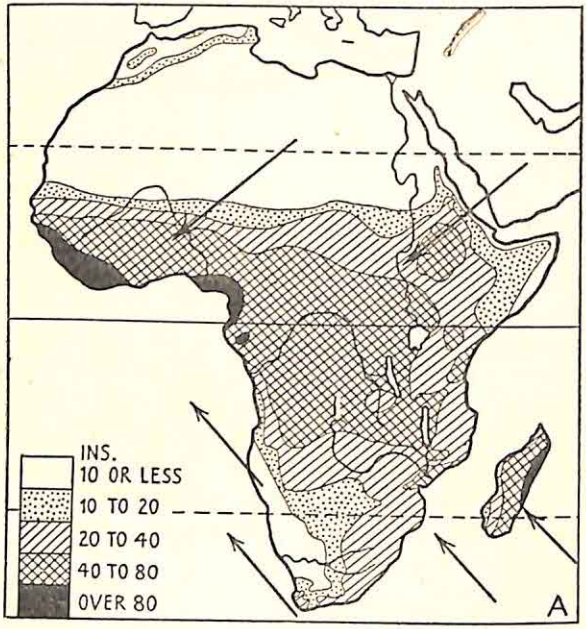


FIG. 206. Africa: Mean Annual Rainfall and prevailing winds.

mainly to the presence of clouds, the highest temperatures are found near the Tropics and not near the Equator.

Winds and Rainfall. We have seen that the temperature belts move north and south with the sun. Likewise, the pressure, wind, and rainfall belts also move north and south with the apparent movements of the sun; but *though the position of the noon overhead sun varies from 23½° N. to 23½° S., yet the wind belts only move in the same direction about 5° (i.e. 5° N. and 5° S.).*

In Africa, the high-pressure belts, with their outblowing winds, stretch across the north and south of the continent, while the low-pressure belt lies about the Equator. All these belts move north and

south with the sun. The north-east and south-east trades always blow from the high-pressure belts towards the low-pressure belt, and as they are blowing from cooler to warmer regions their capacity for absorbing moisture is increased, and they are dry winds gathering moisture from the land over which they pass. So in Northern Africa the north-east trade winds blowing across a great land mass are dry, and their dryness becomes greater as they pass over the land: hence in the trade-wind zone there is the great desert belt of the Sahara extending from the Atlantic to the shore of the Red Sea. In the high-pressure belt in the south of Africa, the south-east trades blow over the Indian Ocean and on reaching the eastern side of the continent bring rain to the windward slopes of the plateau. The Kalahari arid region is much smaller, both on account of the lesser breadth of the southern part of the continent, and because of the rainy region to the east. Though often termed a desert, the Kalahari is by no means a waterless area, such as the Sahara.

When the trade winds, blowing towards the equatorial low-pressure belt, meet, then the currents of heated moisture-laden air rise, and being cooled by expansion cause heavy convectional rains in this region. Rain falls throughout the year, but is heaviest shortly after the equinoxes in March and September. The equatorial rains 'follow the sun', and on both sides of the equatorial wet belt is a zone with summer rains, and a marked dry season which increases in length towards the desert margin.

In the *northern summer* the wind belts have shifted somewhat towards the north. The regions of greatest rain lie north of the Equator: the coast-lands of the Gulf of Guinea and the Cameroons are now two of the wettest parts of the continent (Fig. 207). To the north of this region, a belt of summer rains extends to approximately latitude 16°, beyond which the rainfall diminishes rapidly, practically the whole of the continent lying to the north being rainless. South of the Equator, the high-pressure belt, which has moved northwards, tends to decrease the strength of the south-east trades, and both the interior and the east coast receive comparatively little rain. The south-west, however, now lies in the belt of westerly winds, which have shifted north, and bring winter rains to the region round Cape Town.

In the *southern summer*, climatic conditions are reversed: the wind belts have shifted south. The region of greatest rain lies south of the

Equator in Central Africa, which receives rain not only from the on-shore south-east trades, but also from the winter monsoon winds blowing away from India towards the low-pressure belt over Africa (Fig. 208). In South Africa, the south-east trades also blow strongly on-shore along the east coast, which receives abundant rain, but the

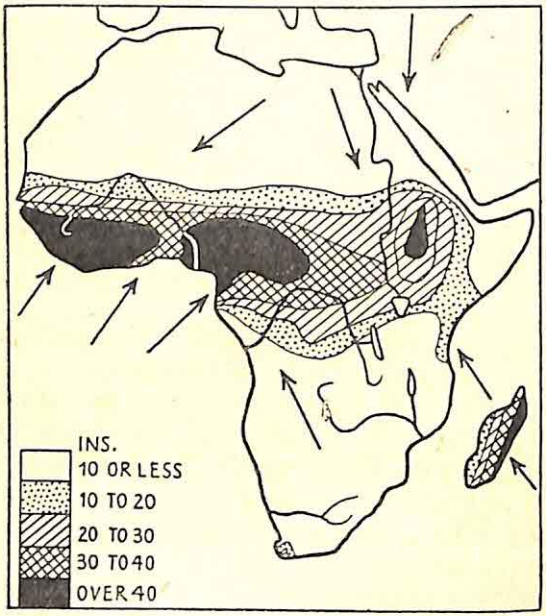


FIG. 207. Africa: Rainfall, May to October.

west coast is rainless, for along it the south-east winds blow off-shore, even as far south as Cape Town, which is having its dry summer season. But North-West Africa now lies in the Westerly Variable wind belt and receives winter rains.

Natural Vegetation and Animals. It has been aptly said that in Africa the vegetation shows that all seasonal change depends on rainfall; and not only do the rainfall belts correspond closely to the Natural Vegetation Zones, but these also correspond to the Major Natural Regions (Fig. 209).

(1) The *Equatorial* (or *Tropical*) *Forests*, with their uniformly high temperatures and heavy rainfall, cover much of the Congo Basin and

the coastlands bordering the Gulf of Guinea. Plant growth is continuous, and from the dense undergrowth trees spring up in tiers, some attaining a height of 180 feet or more. Along the east coast is another belt of less luxuriant tropical forest where trees are smaller and undergrowth less dense. Some animals, like the chimpanzee, are

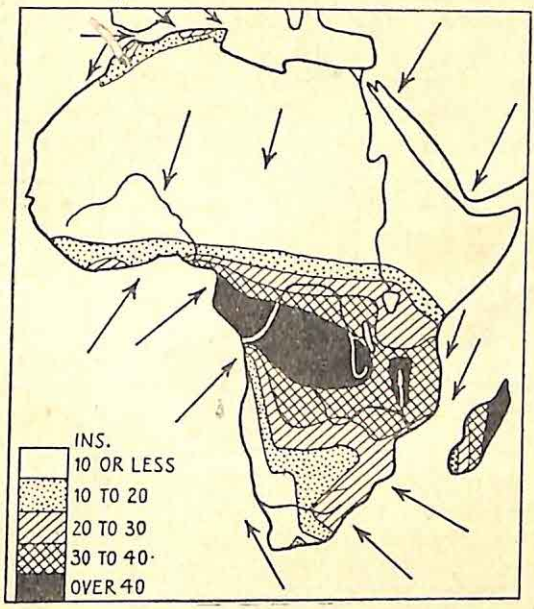


FIG. 208. Africa: Rainfall, November to April.

mainly tree-dwellers; others, such as the hippopotamus, haunt the rivers, while the elephant is found in the more open forest margins.

(2) Except in the western lowlands, the equatorial forests are encircled by *savannas*, where, after the rains, grass springs up in clumps, and trees, such as acacias and baobabs, are of the drought-resisting type. The hoofed animals, like antelopes, giraffes, and zebras, can move swiftly in search of food or when pursued by lions, hyenas, and other carnivores.

(3) Towards the north and south, as the dry season grows longer, the savannas pass into the *deserts*, whose monotonous stretches of rocks, ridges, and wave-like dunes spread to the horizon. Poor steppe

3. Give some account of the chief causes which hindered the 'Opening up' of Africa.

4. Describe, omitting reasons, the general conditions of temperature and rainfall of those parts of Africa which have a Mediterranean type of climate. Name the characteristic crops of such regions, and show how they are adapted to the climatic conditions.

5. Name six of the chief wild animals found on the African savannas, and show how any *two* of them are adapted to the geographical conditions found there.

CHAPTER XXIV

COUNTRIES AND REGIONS OF AFRICA

THE MEDITERRANEAN STATES

THOUGH Morocco, Algeria, Tunisia, and Libya have a Mediterranean climate they contain considerable areas of practically rainless and desert lands. The rainfall decreases (*a*) from the Atlantic seaboard eastward (Algiers 30 inches, Tunis 18 inches per annum), and (*b*) from the Mediterranean southward towards the Sahara.

MOROCCO, ALGERIA, AND TUNISIA

We may distinguish three Natural Regions: (1) the Coast-lands and the Tell; (2) the High Plateaux; and (3) the Saharan Margin.

(1) **The Coast-lands and the Tell.** Behind the broken hills that border the Mediterranean and the Maritime Range of the Atlas lies the Tell. It extends from 50 to 150 miles inland, and stretches from Algeria west into Morocco, where it is separated by a barren strip from the coast, and east into Tunisia. It consists mainly of rolling country dotted with hills planted with olive groves and vineyards; plains sown with wheat and barley; and valleys where oranges, lemons, and tobacco are grown on irrigated lands. The larger farms are owned mainly by Frenchmen who adopt progressive methods, the smaller ones by Arabs and Berbers whose ways are more primitive. Sheep and goats graze on the uplands, where pastures are broken by stretches of evergreen shrubs and forests of cork-oak, cedar, and squat Mediterranean pines. In Morocco the coastal plain, opening to the Atlantic, produces crops similar to those of the Tell.

(2) **The High Plateaux** lie between the Maritime and Saharan Ranges of the Atlas. Nomadic herdsmen graze their sheep and goats on the poor steppes, while considerable areas are covered with alfa (esparto) grass used for making paper and baskets.

(3) **The Saharan Margin** receives little rain. In the natural oases and those round artesian wells are date-palms and irrigated plots where cereals are grown.

Morocco, about as large as France, consists of (1) a French Protectorate, comprising the greater part of the country; (2) a Spanish zone in the north; and (3) the territory round the international port of Tangier. The seaward-facing valleys and the lowlands fronting the Atlantic are the most productive and thickly peopled part of Morocco. The ancient city of Marrakesh is connected by rail with Casablanca, a modern port which dispatches by air considerable quantities of fruit and vegetables to Toulouse, in France.

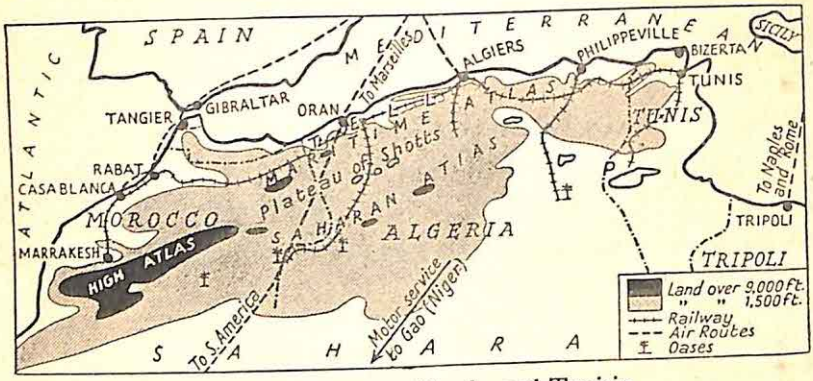


FIG. 210. Morocco, Algeria, and Tunisia.

In their colony of **Algeria** the French have done much to develop the country by building roads and railways, and encouraging agriculture. The bulk of the overseas trade, which is with France, is carried on through *Algiers*, the capital, 400 miles from Marseilles. Exports include wine, cereals, olive-oil, and phosphates; imports, textiles, machinery, motor-cars, and beet-sugar. Iron-ore is mined round *Philippeville* and *Oran*, both connected with Algiers by rail. From Philippeville the railway runs inland, via the El Kantara Gorge, to the oasis of Biskra, whence, for strategic purposes, the line has been pushed south to the margin of the Sahara.

Tunisia is also a French protectorate. *Tunis*, on a poor harbour, lies somewhat to the south of the site of Carthage, the great city which once commanded the route from the western to the eastern basin of the Mediterranean. The naval base of *Bizerta* lies to the north-west. In addition to the Arab population, there are a large number of French and Italian settlers in Tunisia, which lies relatively close to Sicily and the south of Italy.

LIBYA (TRIPOLI)

By extending their Empire across the Mediterranean into Northern Africa, the modern Italians followed the example of the Romans, and in Libya founded a colony whose area is four times that of Italy. Yet in the whole of this country the coastal zone is the only area suited to cultivation, for the greater part lies within the Sahara Desert, where oases, like Ghadames and Kufra, are the only fertile spots. In the oases along the coast are palms and Mediterranean products like vines, almonds, oranges, and mulberries. The dunes, too, are being gradually afforested with pines, acacias, and other trees. Important sponge and tunny fisheries are carried on in coastal waters. Barley and wheat are grown, and Nomad Arabs and Berbers graze sheep, goats, and camels on the rough pastures. The coastal zone is being farmed mainly by Italian colonists. Many settled here in 1938, under a mass-migration scheme organized by the Government. In that year, 1,800 families, drawn from all parts of Italy, and with an average of ten persons a family, were established on new farmsteads, and supplied with implements, seed, and cattle. With a view to further developing the country, the Italians built a road, suitable for motor traffic, stretching for 1,200 miles along the whole length of the coast from the Tunisian to the Egyptian frontier. In the interior transport is carried on mainly by camel caravans. *Tripoli* (100,000) and Benghazi, north of the Gulf of Sidra, are the chief towns.

During the Second World War, Libya was conquered by British troops, who advanced from the frontier of Egypt through Libya into Tunisia.

EXERCISES

1. Draw a sketch-map of the Mediterranean Lands of North Africa, west of the Gulf of Gabes. On your map mark the three natural regions into which this area may be divided. Summarize, in tabular form, the chief products of each region. Describe in detail *one* region.

2. Illustrating your answer by sketch-maps, show how geographical factors have contributed to the importance of the following towns: Algiers, Tangier, and Tripoli.

1. CLIMATE	2. VEGETATION	3. CROPS AND ANIMALS
Warm winters with slight rain – hot, dry summers	Desert except in irrigated Nile valley – cultivated strip varies from 1-9 miles.	Cotton, sugar, rice, millet, wheat, barley palms, maize, peas, lentils, pulses.
Warm winters, hot summers, little or no rain.	Desert (with some oases).	Millet, ground nuts, date palms in oases, camels, cattle, sheep, goats.
Hot throughout year – very slight rain in summer e.g. Khartum receives 3·8in. in July and August out of an annual total of 5in.	Scrub.	Cotton on irrigated land (Gezira), millet, ground nuts, date palms, gum arabic, cattle.
Hot throughout year – heavy rain in summer especially in mountain areas	Savannas.	Cotton, bananas, cattle.
Hot and wet at all seasons	Forest (and savannas at higher elevations).	

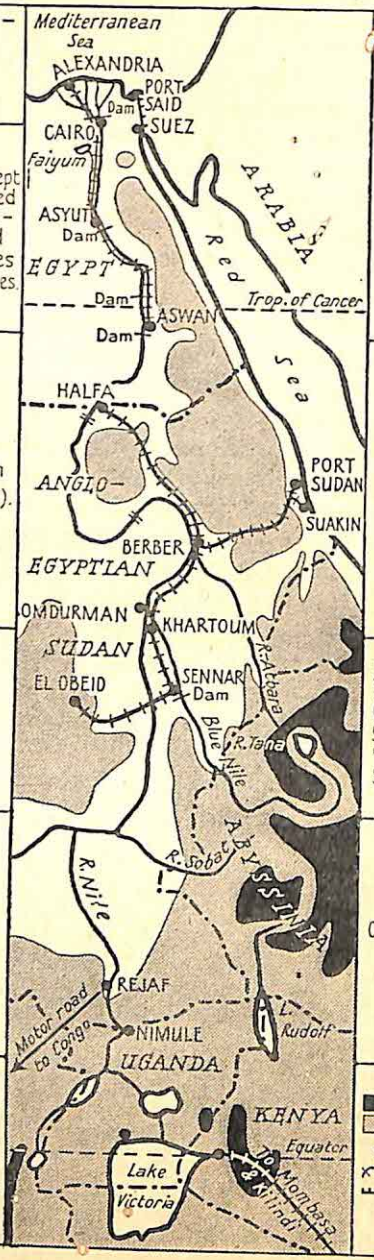


FIG. 211. The Nile.

THE NILE—THE SUDAN AND EGYPT

THE NILE

There is no river in the world quite like the Nile, 4,000 miles long; for though in the last 1,700 miles of its course it receives no tributaries, yet its waters alone make possible that irrigation without which rainless Egypt would be a desert—part of the vast Sahara.

On emerging from Lake Victoria, the Nile flows across the plateau and descends the Ripon and Murchison Falls, to the northern end of Lake Albert. In this upper portion of its course the flow is constant, for the river is fed by equatorial rains stored in the natural reservoirs of the lakes. On leaving Lake Albert, the Nile enters an alluvial plain, being navigable as far as Nimule, on the frontier of Uganda and the Anglo-Egyptian Sudan. Beyond this town more rapids prevent the passage of river craft, and the northward journey must be made by the motor-road that runs for about a hundred miles to Rejaf, where it is joined by another road, completed in 1935, from Stanleyville on the Congo. Communication between Rejaf and Khartoum is maintained by steamers which cover the distance in nine days. The Nile constantly broadens into marshes and swamps, beyond which stretch savannas which gradually pass into scrub land as the summer rainfall decreases. In places the fairway is only kept open with difficulty owing to the presence of masses of floating vegetation, called sudd, which block both the main stream and its tributaries. Sometimes the latter are dammed up by the sudd, forming temporary lakes, known as raft lakes. Their life, however, is short, as they dry up owing to the great evaporation. So great is the evaporation in this region that though numbers of tributaries enter the main stream, its volume actually diminishes. About latitude 10° N. the Bahr-el-Ghazal from the west, and the Sobat from the Highlands of Abyssinia, enter the White Nile. Meanwhile the rainfall grows steadily less until at Khartoum it is practically negligible.

At the latter town, the Blue Nile, flowing out of Lake Tana, high up in the Abyssinian Plateau, enters the Nile; and at Berber the Atbara—the last tributary—joins the river. The heavy summer monsoon rains of Abyssinia cause these rivers to rise rapidly, and rushing down the steep mountain slopes they pour their waters, laden with rich volcanic sediment, into the Nile. The Blue Nile, the

Atbara, and minor streams from the highlands, begin to rise in June, and the flood-water reaches Aswan about mid-September, and Cairo a month later. So great indeed is the volume of water brought down by the Blue Nile that this river dams back the main stream, whose waters, thus retarded for a time, reach Egypt in the winter season and so help to preserve a constant flow after the main flood-waters have subsided.

From Khartoum to Aswan the Nile traverses a comparatively narrow valley, and navigation is interrupted by a series of six rapids, called cataracts, where the stream rushes over beds of hard, resistant rock. Below Aswan, the valley grows still narrower, being bordered on both sides by steep cliffs which are from 2 to 15 miles apart. At Cairo, the Nile enters its great delta, crossed by many distributaries, and flows into the Mediterranean through several mouths.

THE ANGLO-EGYPTIAN SUDAN

The central portion of the Anglo-Egyptian Sudan forms part of the great savanna belt extending from the Abyssinian Highlands to the Atlantic, and lying between the Sahara on the north and the equatorial forest region on the south. *The whole of this belt forms the actual Sudan*, whose name means 'the Land of the Blacks', so called because of its indigenous negro population.

The Anglo-Egyptian Sudan, with an area of nearly 1,000,000 square miles and a population of 6,000,000, forms part of the British Empire, being administered by a Governor-General, appointed by Egypt with the assent of Great Britain. Extending from latitude 4° N. to about latitude 20° N., it may be divided into two *Natural Regions*: (1) The *Savannas* of the true Sudan, with high temperatures and heavy summer rains, especially in the mountain areas; and (2) The *Scrub and Desert Region*, hot throughout the year with only very slight rain in summer; e.g. Khartoum, out of a total annual rainfall of 5 inches, receives 3·8 inches of rain in July and August.

Cotton, the main crop, constitutes somewhat more than half the value of the country's exports, the bulk being sent to Lancashire. Somewhat more than half the cotton is grown in the Gezira, the district between the Blue and the White Nile, where the construction of the Makwar Dam, at Sennar, on the former river has made possible the irrigation of a considerable area. Cotton is also cultivated on irrigated lands round Kassala, and as a rain crop in the south.

Many dates are grown in the north, while millet is the staple food crop. The Sudan is the chief source of the world's supply of gum arabic—used in the manufacture of confectionery—obtained by tapping the acacias of the southern forests and savannas. Vast herds of cattle are kept by native herdsmen on the savannas; sheep in the somewhat cooler regions, and in the north numbers of humped cattle are bred. The exports of these regions consist mainly of hides, but beef cattle are sent to Egypt, either by rail or river, or via Port Sudan. Gold is mined in the Red Sea Hills, and near Port Sudan are salt pans which supply not only the needs of the country, but also considerable quantities of salt for export.

Khartoum, the capital, at the confluence of the White and the Blue Nile, stands a few miles above the old Dervish capital of Omdurman, the largest town in the Sudan, on the opposite bank of the main stream. From Khartoum the railway runs through Berber to Halfa, the rail-head on the Egyptian frontier, situated below the second cataract, whence there is steamer communication with Aswan. A little north of Berber a line runs to Port Sudan, on the Red Sea, which has replaced Suakin, whose harbour is of little use owing to the growth of a coral reef. The British Overseas Airways Route crosses the Sudan, and thus Khartoum is but a few days distant by air from both Cape Town and London.

EGYPT

Though Egypt is more than four times the size of Great Britain, yet nearly all its 14,000,000 inhabitants live in an area somewhat less than half the size of Wales; for as the country receives so little rain (Cairo, annual rainfall 1 inch; Alexandria, 8 inches), the only regions suited for settlement are the delta (Lower Egypt), and the trough-like valley of the Nile (Upper Egypt) where the irrigated belt is from 1 to 10 miles wide. Except for the life-giving waters of the Nile, Egypt would be a desert.

There are two principal methods of irrigation. (1) The older *basin method* is widely practised in Upper Egypt, especially *above* the Aswan dam. When the floods begin to rise, in September and October, shallow canals admit the water into embanked fields where it remains until the soil is thoroughly moistened and covered with rich silt. After the waters subside the crops are sown in the wet soil. In those fields from which the water drains off first, the period preceding

the cool winter season is long enough to allow maize to ripen; but in most cases winter wheat and barley—both of which ripen towards the end of April—together with pulses, lentils, and fodder crops like clover, are sown. When the crops have been harvested the land, owing to lack of water, remains fallow until the next flood season.

(2) The modern method allows of *perennial irrigation.* During flood season, the river is held back by dams so that it forms a head of water which is carried by deep canals, below the dam, to many smaller canals and channels. This method was first applied to Lower Egypt by building a barrage at the apex of the delta just below Cairo. Since then other barrages have been built at Asyut, Esna, and Girga, as well as the dam, 1¼ miles long, at Aswan, which enables water to be held back for use in the canals of Upper Egypt during the low-water season.

By perennial irrigation agricultural production has been enormously increased, for, unlike the basin method, it allows full advantage to be taken of the hot season and so permits such crops as cotton, rice, sugar-cane, and dates to be grown. All these require high summer temperatures and much moisture. Cotton is by far the most important: it supplies 80 per cent. of the total exports of the country, and of this amount the bulk is sent to the British Isles, where it is in great demand owing to its long fibre and because its quality is usually superior to that of most American cottons.

In some districts, especially south of Aswan, water is raised by modern oil-pumps. In others, such as the delta, the fellahin (peasants) lift it by means of water-wheels worked by buffaloes or oxen; or even use the shaduf, just as their ancestors did in Bible times. The depression, known as the Fayum, lying to the west of the delta, is irrigated from the Bahr-el-Yusuf, a stream running out of the Nile. The majority of the Egyptians depend on agriculture for their living. They live in small villages, and there are few large towns.

Cairo (1,000,000), the capital, stands at the head of the delta. Through *Alexandria* (500,000), the chief port, is exported the entire cotton crop, as well as sugar, grain, and rice. *Port Said* (100,000) is situated at the northern end of the Suez Canal.

The Suez Canal, 103 miles long, by connecting the Mediterranean and Red Seas shortens the distance from England to India by 4,000 miles, to Australia by 1,200 miles, and to East African ports by

some 2,000 miles. Begun in 1859, it was completed ten years later. More than three-fifths of the ships passing through the canal are British, as is also somewhat more than half the total tonnage.

EXERCISES

1. (*a*) What is the chief cause of the Nile floods, upon which the prosperity of Egypt depends? (*b*) During what months are the waters of the Blue Nile (i) highest, (ii) lowest? (*c*) At what season of the year are the waters of the White dammed back by the Blue Nile? Give the reason. What effect does this damming back have on the winter flow of the Nile through Egypt? (*d*) At what time of the year does the Nile reach its maximum height at (i) Aswan, (ii) Cairo?

2. (*a*) Name *four* places in Egypt and *one* in the Anglo-Egyptian Sudan where irrigation dams or barrages have been constructed. (*b*) Describe briefly *three* methods of irrigation practised in Egypt. (*c*) Name the chief crops cultivated in Egypt by the *fellahin* (agriculturists) during each of the three seasons.

3. Write an account of the Anglo-Egyptian Sudan under the headings: relief and drainage, climate, crops and exports.

4. Compare the valley of the Nile with that of the Euphrates–Tigris. State, with reasons, which you consider the more important.

THE SAHARA

The Sahara, greatest of all deserts, lies in the North-East Trade Wind belt (Fig. 212). From west to east it extends for 3,000 miles, and from north to south for 1,200 miles. It is crossed from north-west to south-east by the Ahaggar and Tibesti Highlands. It is difficult to imagine the intense summer heat. The mean July temperature exceeds 90° F. The absence of clouds allows the sun's rays to beat fiercely down upon the bare ground during the day, but at night temperatures fall rapidly, as owing to the clearness of the sky radiation is great, there being few clouds to check the escaping heat. Moreover, the range of temperature is increased by the absence of protective covering. In parts of the Sahara the annual range is as much as 44° F., and the daily range as great as 36° F.

Much of the surface consists of bare rocky plateaux, stretches of stony desert, and vast expanses of sand-dunes swept into wave-like ridges, and cut deep by wadis which are only filled after one of the very rare rain-storms. Though enormous tracts are quite devoid of vegetation, in those regions, chiefly on the desert margins, which receive 10 inches of rain per annum, thorny scrub and poor pastures are found. Underground supplies of water give rise to oases. Some

dwell in scattered villages. They graze many horned cattle, sheep, and goats, and rear ponies and mules—the chief transport animals—on the rolling grasslands. They merely grow enough food for their own needs, millet being the principal crop. The ground is lightly scratched with a crude wooden plough, drawn by a yoke of oxen, and after harvest the fields are left fallow for some years.

The topography of Abyssinia, with its difficulties of communication, favoured the rise of feudal chiefs, and prevented the establishment of a strong central authority. Ill armed and ill prepared, the Abyssinians fell easy victims to the Italians, who, from their former colonies of Eritrea and (Italian) Somaliland, invaded the country and occupied it until 1941, when it was liberated by the British. There are few towns in our sense of the word: *Addis Ababa*, the capital, has a population of 100,000. Much of the interior trade is carried on by camel caravan. A railway links Addis Ababa with *Jibuti*, the port of *French Somaliland*.

British Somaliland is inhabited by nomadic tribes. Transport is by camel caravan and motor-car. From Berbera, the capital, hides and skins are shipped to Aden for re-export.

EXERCISE

1. Write an account of Abyssinia under the headings: relief, climate, occupations, transport.

TROPICAL EAST AFRICA

BRITISH EAST AFRICA

British East Africa consists of the following colonies and protectorates: Kenya and Uganda, the islands of Zanzibar and Pemba, Nyasaland, and the mandated territory of Tanganyika.

This portion of Tropical East Africa may be divided into two Natural Regions: (1) the Coastal Plain, and (2) the Plateau.

(1) **The Coastal Plain** consists of a relatively narrow lowland, stretching from the Indian Ocean to the escarpment marking the edge of the Plateau. The mangrove swamps along the coast, the coco-nut palms fringing the sandy shores, the tropical forests, and fields of rice and sugar-cane all attest to the hot, wet climate of this region. Climatically *Zanzibar* and *Pemba* form part of it.

Zanzibar and *Pemba* are separated from Tanganyika by a channel 22 miles wide at its narrowest part. Zanzibar, with an area of 640 square miles, is the bigger, and is also the largest coralline island off the coast of East Africa. Once centres of the slave trade, the islands

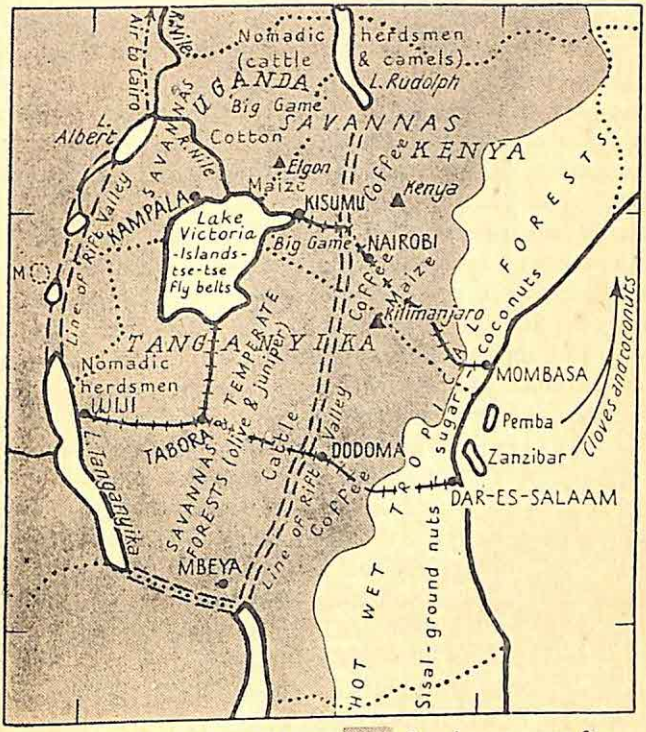


FIG. 214. British East Africa. Land over 3,000 ft.

are now a British protectorate. They produce the bulk of the world's cloves as well as considerable quantities of copra. The Arabs are the principal landowners, but the majority of the people are native Africans. There are also some 14,000 British Indian subjects through whose hands passes most of the trade of East Africa.

(2) **The Plateau**, which has an elevation of some 4,000 feet, is cut by the Eastern and Western Rift Valleys. The relatively low-lying

district round Lake Victoria is hot, receiving a somewhat heavier rainfall than the rest of the plateau, which has a healthy climate. At Nairobi (5,450 feet) the weather is usually no warmer than in the south of England in summer. The climate has enabled Europeans to make permanent homes in the Highlands. Other immigrant peoples include British Indian subjects, many of whom occupy responsible positions on the railways, while others are employed in the hotels or are shopkeepers.

There are vast savannas, the haunt of 'big game', on which the natives graze enormous herds of humped cattle. In more elevated areas are extensive temperate forests whose trees include junipers, cedar, camphor, and olives.

Cotton is widely grown, especially in Uganda, where it is cultivated almost entirely by native Africans, who, unlike the hoe-cultivators in other parts of Tropical Africa, use modern ploughs and other implements. In Kenya and Tanganyika, apart from food crops, such as wheat, maize, and bananas, most of the produce comes from plantations managed or owned by Europeans using native labour. Among the chief crops are coffee, grown mostly in Kenya; cotton from Uganda; sisal and ground-nuts for which Tanganyika is important; and tobacco, cultivated in Nyasaland.

Communications. There are steamer services on the lakes. The main line of the Kenya and Uganda Railway runs from *Mombasa*, the chief port, through *Nairobi*, the capital of Kenya, and *Nakuru* (branch line to Kisumu, on Lake Victoria) to *Kampala* and other towns in the Uganda Protectorate. From the south of Lake Victoria another line runs into Tanganyika, where it joins the railway from *Dar-es-Salaam* (the chief port) to *Kigoma*, on Lake Tanganyika. A line runs from Beira, in Portuguese East Africa, across the Zambezi into Nyasaland, running through *Blantyre* to the southern end of Lake Nyasa. The British Overseas Airways Corporation (B.O.A.C.) service makes it possible to reach British East Africa in a few days from either London or Cape Town.

NORTHERN AND SOUTHERN RHODESIA

The British colonies of Northern Rhodesia (290,000 square miles) and Southern Rhodesia (150,000 square miles) form a transitional area between British East Africa and the Union of South Africa, and like both of these regions they consist mainly of high plateaux. Though

the Rhodesias lie entirely in the tropics they are comparatively cool, receiving most rain in summer with occasional showers during the 'dry' winter season. The natural vegetation consists mainly of savannas—more thickly wooded in Northern Rhodesia—with forests (yielding teak) in the valleys. These grass-lands, especially those of Southern Rhodesia, are well suited both for stock-rearing and agriculture. Many cattle are bred. In the latter colony dairying is rapidly

FIG. 215. Northern and Southern Rhodesia. Land over 3,000 ft.

increasing in importance, and butter and cheese now figure in the list of exports. The chief crops are maize, wheat, tobacco, oranges, lemons, and warm temperate fruits.

The most important occupation is mining. Copper, gold, silver, lead, and zinc (Broken Hill) are the chief minerals obtained from Northern Rhodesia, but of these copper, yielding over 80 per cent. of the exports, is by far the most important. Gold heads the list of Southern Rhodesian exports, accounting for nearly 50 per cent. of their total value, and chromite and asbestos are also mined. The nearest seaport is Beira (Portuguese), linked by rail with *Salisbury*, the capital of Southern Rhodesia. From Salisbury the line traverses a dairying district to Bulawayo, where it joins the main line from Cape Town to the north. After leaving Bulawayo it runs through the coal-mining centre of Wankie, continues north-west and, crossing the Zambezi, enters Northern Rhodesia at *Livingstone*, situated close to the famous Victoria Falls. Continuing north the railway runs through *Lusaka*, chosen as the capital of Northern Rhodesia owing to its central position, to Broken Hill. Some distance north of that mining centre the line crosses the frontier and links up with the Belgian Congo railway system.

Nearly 50 per cent. of the world's *cacao* is obtained from the Gold Coast, whose climate makes it ideal for the cultivation of this tropical product, found only within 20 degrees of the Equator. Cacao requires great heat and moisture, but needs shelter from the winds, and shade to protect it from excessive heat. The flowers spring from 'cushions' on the trunks and branches of the trees; and both flowers and also young and mature pods are seen at the same time. After the beans have been extracted they are either dried in the sun or by artificial means, and then sent by lorry or rail to the port of export.

(2) **The Plateau Region.** The coast-lands rise steeply to the interior plateau, where the natural vegetation is of the savanna type. The Plateau may be divided into (*a*) the wooded grass-lands of the south, which receive heavy summer rains, and (*b*) the semi-arid pastoral belt farther north, where the rainfall is deficient and the dry season lasts as long as nine months on the desert margin. The natural vegetation consists of bush with stretches of poor grassland which withers up during the dry season. Vast tracts are inhabited by nomadic herdsmen. Hoe-cultivation is the rule, and when the ground is exhausted, the natives clear fresh areas by burning the bush, whose ash, for a time, enriches the soil. The chief crops are cotton, especially important in Nigeria; food crops like maize, millet, and wheat; and ground-nuts grown mainly in the drier areas of Northern Nigeria, French Equatorial Africa, and the Gambia. The nuts yield a pale yellow oil used in the manufacture of margarine and the cheaper kinds of salad-oil.

Communications and Political Divisions. Though the Niger is, of course, the chief water-way, most of the rivers can be navigated for long stretches by boats and large steel canoes of shallow draught. There is considerable traffic on the Middle Niger, and small ocean craft can ascend the river to the Fafa Rapids, 400 miles from the sea. A number of railways, running inland from the ports, have done much to open up the districts they serve.

British Possessions. *Nigeria* is about four times the size of Great Britain. With nearly 20 million inhabitants, it has, with the exception of India, a greater population than any other overseas state in the British Empire. From *Lagos* (130,000), the chief port, the railway runs through the forest belt to *Ibadan* (380,000), and thence to

Jebba, where it crosses the Niger. Northwards, traversing savanna country, it passes through Zaria to the walled city of *Kano*, once the greatest slave market in West Africa, and still a caravan centre to which are brought hides and skins from the savannas, salt and dates from the desert, to be exchanged for produce carried by rail. From Zaria a light railway runs to the granite Bauchi Plateau, noted for its tin mines. Southward from this district another light railway runs through Udi, a coal-mining centre, to Port Harcourt.

The Gold Coast. Apart from the modern deep-water harbour of *Takoradi*, the chief ports are *Accra*, *Cape Coast*, and *Winneba*, where goods, as at most West African ports, are shipped on board steamers by surf-boats. *Kumasi* is the principal inland town. Gold (alluvial) ranks second to cacao in the export list. *Sierra Leone*, capital *Freetown*, exports palm-oils and kernels, and ginger. *Gambia* lies wholly in the savanna region. The capital is *Bathurst*, which exports groundnuts.

French Possessions. Most of the *Senegal* lies in the savanna belt. From Dakar, an airport on the France–South America route, a railway runs to Kayes, on the Upper Senegal, and thence to Bamako, on the Upper Niger. Small steamers can ascend the Senegal as far as Kayes during the rainy season. The *Ivory Coast* exports cacao, palm-oils, and kernels. The former German colony of the Cameroons and *French Congo* are both included in *French Equatorial Africa*, of which the seaport of Libreville and Brazzaville, on Stanley Pool, are the chief towns.

Liberia exports coffee, palm-oil and kernels, and cacao. The capital is Monrovia.

EXERCISES

1. (*a*) Draw a map of West Africa. (i) On it mark and name the Niger and two important tributaries, (ii) indicate and name the principal natural regions, and (iii) mark and name *six* of the chief ports. (*b*) Name *three* important crops grown (i) in the lowlands, and (ii) in the highlands. Describe the conditions necessary for the large-scale cultivation of *one* crop taken from each region.

2. Describe the geography of Nigeria under the following headings: Relief, Climate, Natural Vegetation and Crops, Towns, and Communications.

3. Give an account of a journey by a tramp steamer from Bathurst to Lagos, calling at the chief ports *en route*, and state the probable cargoes that might be shipped at each place of call.

THE CONGO BASIN

THE BELGIAN CONGO

The Congo drains a circular plain-like basin, most of which is over 1,000 feet above sea-level, and which is almost entirely surrounded by the edges of higher plateaux. Nearly the whole of the basin, whose area is about 1,000,000 square miles, falls within the Belgian Congo.

The main stream and its tributaries, of which the longest are the Ubangi and the Kasai, lie within the equatorial wet belt, and thus the Congo probably conveys more water to the ocean than the total carried by all other great African rivers. Owing to the great heat and heavy rainfall, the whole basin—except in more elevated and cooler regions like the Katanga Highlands—is clad with tropical forest where oil-palms, mahogany, bamboos, bananas, and rubber-yielding vines rise in tiers above the dense undergrowth. The high temperature (and humidity) which give rise to this luxuriant vegetation, never falls sufficiently to impose an interval of rest on trees that are always green. The pygmies who inhabit the less accessible regions live mainly by hunting and collecting fruit, honey, and birds' eggs. Other native tribes depend almost entirely on hunting and fishing, but those more advanced live in semi-permanent villages, cultivating clearings where they grow yams, bananas, manioc, and other food crops. On plantations managed by Europeans, cotton, coffee, palms yielding oil and kernels, sugar-cane, and cacao are grown. Copal gum and ivory are also among the forest products, but little rubber is now obtained from the Congo.

There is much valuable timber, including mahogany and other hard woods, but despite some 6,000 miles of waterways suitable for floating logs little lumbering is carried on. This is due to several reasons. At times, such as when they are clearing a piece of virgin forest to make a new plantation, the negroes work really hard, but they prefer casual rather than constant toil. To the labour problem must be added the fact that the trees occur in single stands and, owing to their buttress-like roots, many cannot be cut below eight or more feet from the ground. It is quite useless to fell trees more than a few hundred yards distant from navigable streams and even when they have been cut through they may, in spite of their weight, fail to fall, so closely

are they surrounded and interlocked by other trees and vegetation. Cattle thrive only in districts where there is no tse-tse fly, notably in the highlands of Ituri, Katanga, and Kivu.

The Katanga Highlands are the principal copper-mining area in the Belgian Congo. The chief mines, which are near *Elizabethville*

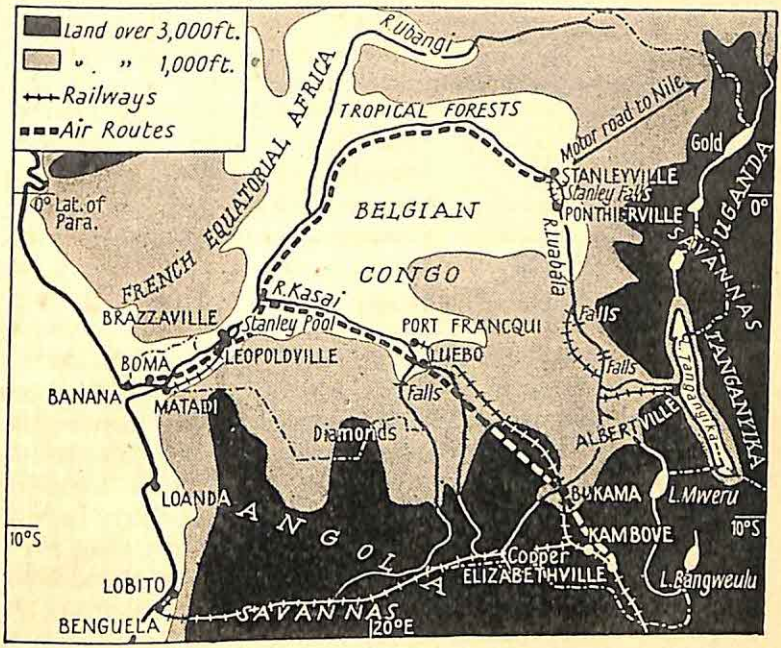


FIG. 217. The Congo Basin.

and *Kambove*, are connected by rail with *Bukama* on the Congo. From Elizabethville the line is continued south through the Rhodesias to Cape Town, a five days' journey. The Rhodesias send coal (from Wankie), fruit, and other foodstuffs northward by this railway to Katanga. The recently completed railway to Lobito, Portuguese West Africa, is now the main outlet for this part of the Belgian Congo. Copper and gold are the chief exports. Gold is mainly obtained from the *Kilo-Moto* mines.

Communications. Ocean vessels can steam up the Congo estuary, past *Banana* and *Boma*, to *Matadi*, 100 miles from the sea.

Above this town rapids, extending for some 250 miles, render navigation impossible, and the journey to Leopoldville, on Stanley Pool, must be made by rail. Beyond *Leopoldville*, the Congo is navigable for 1,000 miles to Stanleyville, situated near the base of Stanley Falls, which are avoided by a railway running to *Fonthierville*, above the falls. The Congo, now known as the Lualaba, is again navigable in two stretches—separated by rapids, but linked by rail—as far as Bukama, whose connexions with Portuguese West Africa and the Union of South Africa have already been described.

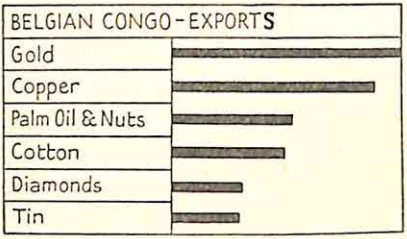


FIG. 218.

There is a pipe-line from Matadi to Leopoldville for the purpose of pumping oil for use in river steamers plying above the latter town. Roads are few, but a motor-road, opened in 1935 and suitable for traffic throughout the year, runs from Stanleyville to Rejaf on the Nile.

Air Transport has made rapid strides. There are regular services between Leopoldville and (1) Boma, (2) Stanleyville, and (3) Luebo. In addition there is a weekly service from Leopoldville to Brussels, a distance of 5,173 miles.

ANGOLA (PORTUGUESE WEST AFRICA)

The south-west of the Congo Basin, and the western slopes of the plateau drained to the Atlantic, form Angola (487,788 square miles). On the highlands cattle, sheep, and goats are grazed; and cotton, coffee, maize, and wheat cultivated at appropriate elevations. In the forests of the coastal lowlands are many oil-palms, with some sugar plantations in the cleared areas. The chief ports are *Loanda* and Benguela, with Lobito. It is now possible to travel from Lobito right across the continent, via the Belgian Congo and the Rhodesias, to Beira in *Portuguese East Africa* (Mozambique).

EXERCISES

1. (*a*) Describe the climate of the Congo Basin with regard to (i) Temperature and (ii) Rainfall. Explain why the annual range of temperature is so small. (*b*) Give some account of the Natural Vegetation. (*c*) Name *five* important cultivated crops, and state why this region is suitable for the large-scale production of *one* of them.

2. Illustrating your answer by a sketch-map, describe the communications of the Congo Basin. So far as you can, account for their development.

3. Compare and contrast the Congo with the Nile under the headings: Relief and Drainage; Climate; Products; Navigation; and Distribution of Population.

4. (*a*) Draw a sketch-map to show the railway from Lobito to Beira. On your map mark and name the chief towns and name (without boundaries) the countries traversed by the line. (*b*) Describe the natural resources and the occupations of the people living in the regions crossed by the railway.

THE UNION OF SOUTH AFRICA

The Union of South Africa has an area of nearly half a million square miles, and a population of about 8,000,000, including 2,000,000 Europeans. The latter are of British stock, or are Boers, who are descendants of Dutch settlers with some admixture of French Huguenot blood.

Apart from their different national origin, these two European peoples also differ in their occupations. The British are chiefly concerned with commerce, mining, and finance, while the majority of the Boers are farmers. The former speak English: the latter, Afrikaans, a variant of Dutch. The native population are mainly Bantus. About half of the Bantus are pastoral and agricultural folk, living in their kraals, ruled by their chiefs, and grazing cattle and growing mealies, their staple food crop. Some work on farms owned or managed by white people; some in the mines, while others are employed in the towns as 'unskilled' labourers. There are also about a quarter of a million Asiatics, who are mostly Indians, but some of whom are Malays. Most of the Indians live in Natal, where many are descendants of coolies, who came from India to work on the plantations, on which many Indians are still employed. The remaining peoples include about three-quarters of a million who are of mixed white and coloured descent. The majority of these 'coloured peoples' are found in the south-west of the Cape Province.

The provinces of the Union are the *Cape of Good Hope*, *Natal*, the *Orange Free State*, and the *Transvaal*. The seat of the Legislature is at Cape Town; that of the Government at Pretoria. The Protectorates of *Bechuanaland*, *Basutoland*, and *Swaziland* are at present administered by the British Colonial Office.

The greater part of South Africa consists of a high plateau, most of which exceeds 4,000 feet, with considerable areas rising above 6,000 feet. On the east the plateau sinks through the Drakensbergs,

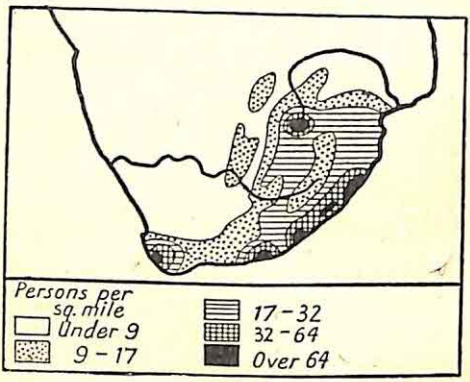


FIG. 219. South Africa: Distribution of Population.

whose steep escarpments rise above the East Coast Belt: on the south it descends steeply to the plateaux of the Great Karroo and the Little Karroo. The Orange and its tributary the Vaal rise in the Drakensbergs. The main stream, which flows to the Atlantic in a deep, boulder-strewn gorge, is interrupted by falls, and is useless for navigation, though in some districts its waters are used for irrigation.

The following Natural Regions are distinguished mainly by their climate:

(1) **The High Veld**, which forms the eastern part of the plateau, receives summer rains which are heavier in the east and diminish towards the west. Much of this region is a pastoral area where sheep are bred for wool. Oxen and mules are the chief transport animals, for they are not so liable to 'horse-sickness' as horses. Cattle

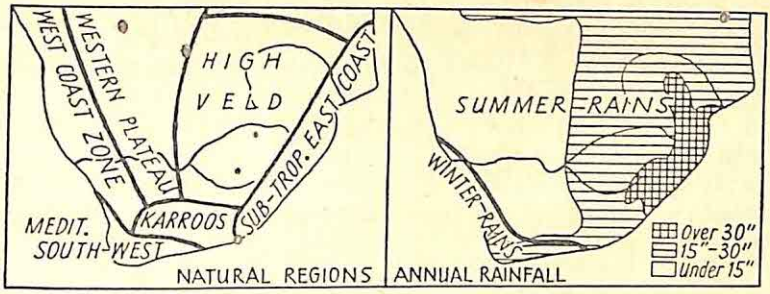


FIG. 220. South Africa: Natural Regions and Rainfall.

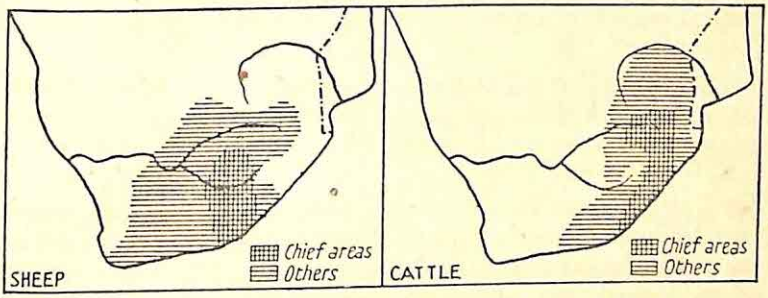


FIG. 221. South Africa: Distribution of Sheep and Cattle.

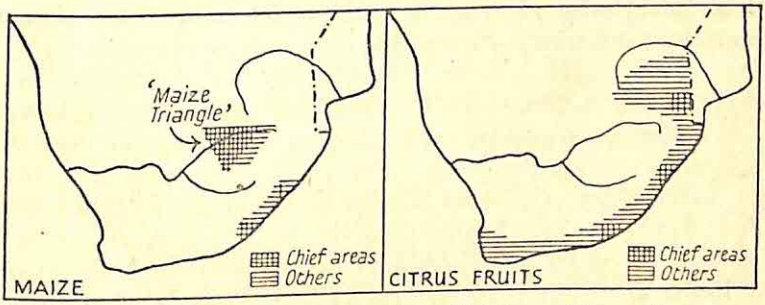


FIG. 222. South Africa: Distribution of Maize and Citrus fruits.

are grazed in the wetter areas and sheep in the drier districts. The number of sheep per acre is small, thus the farms are large, and the farmsteads far apart. This isolation accounts in large measure for the independent and somewhat conservative outlook of the Boer farmers. Maize, or mealies as it is known, the main cereal crop of the wetter areas, is the staple food of the native. Citrus fruits, especially oranges, and also tobacco, are grown in irrigated valleys in the Transvaal, which has a warmer climate than the south of the High Veld.

(2) **The Western Portion of the Plateau,** which receives even less rain than the High Veld, is a poor pastoral area. The northern part of this area forms the *Bechuanaland Protectorate*, which is inhabited mainly by pastoral tribes. On the west the Plateau sinks to

(3) **The West Coast Plain** which, north of the region round Cape Town, is almost rainless and very sparsely peopled. Its chief economic value lies in its diamonds (see Minerals, p. 375).

(4) **The Karroos** are dry treeless plateaux whose surface, strewn with boulders and dotted with small bushes, is broken only by solitary flat-topped kopjes, as the little hills are called. Millions of sheep feed on the Karroo bush, while in the west goats are reared. The former are bred for wool, the latter for their mohair, both products being exported from *East London*, the chief wool market and wool-exporting port of the Union. Most of the former ostrich farms have now been replaced by pig and poultry farms.

(5) **The South-West** has a Mediterranean climate. It is the chief fruit-producing region in South Africa, growing oranges, peaches, apricots, plums, and pears; as well as grapes, both for table use and for wine. Much of the land is irrigated, but in many districts fruit and other crops depend entirely on rainfall. This is the chief wheat-growing area in the Union, and local supplies are sufficient except in poor harvests when wheat is imported from Australia.

(6) **The East Coast** is a sub-tropical region with rain at all seasons, but mostly in summer when the south-east trades blow strongly

on-shore. Within this region three belts may be distinguished: (*a*) The coastal zone, where sugar-cane, bananas, and pine-apples are grown; (*b*) the higher middle agricultural zone, whose cooler climate favours the production of maize; and (*c*) the slopes of the Drakensbergs, which are mainly a pastoral region.

Minerals. Almost half the world's *gold* is obtained from South

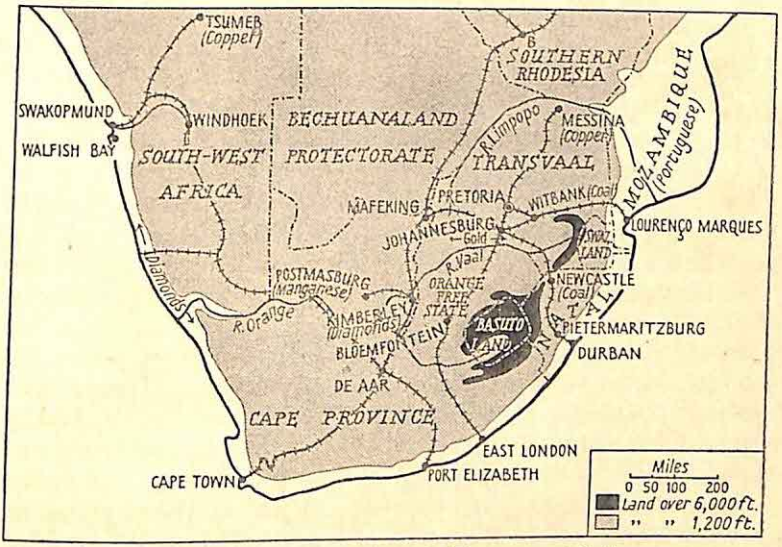


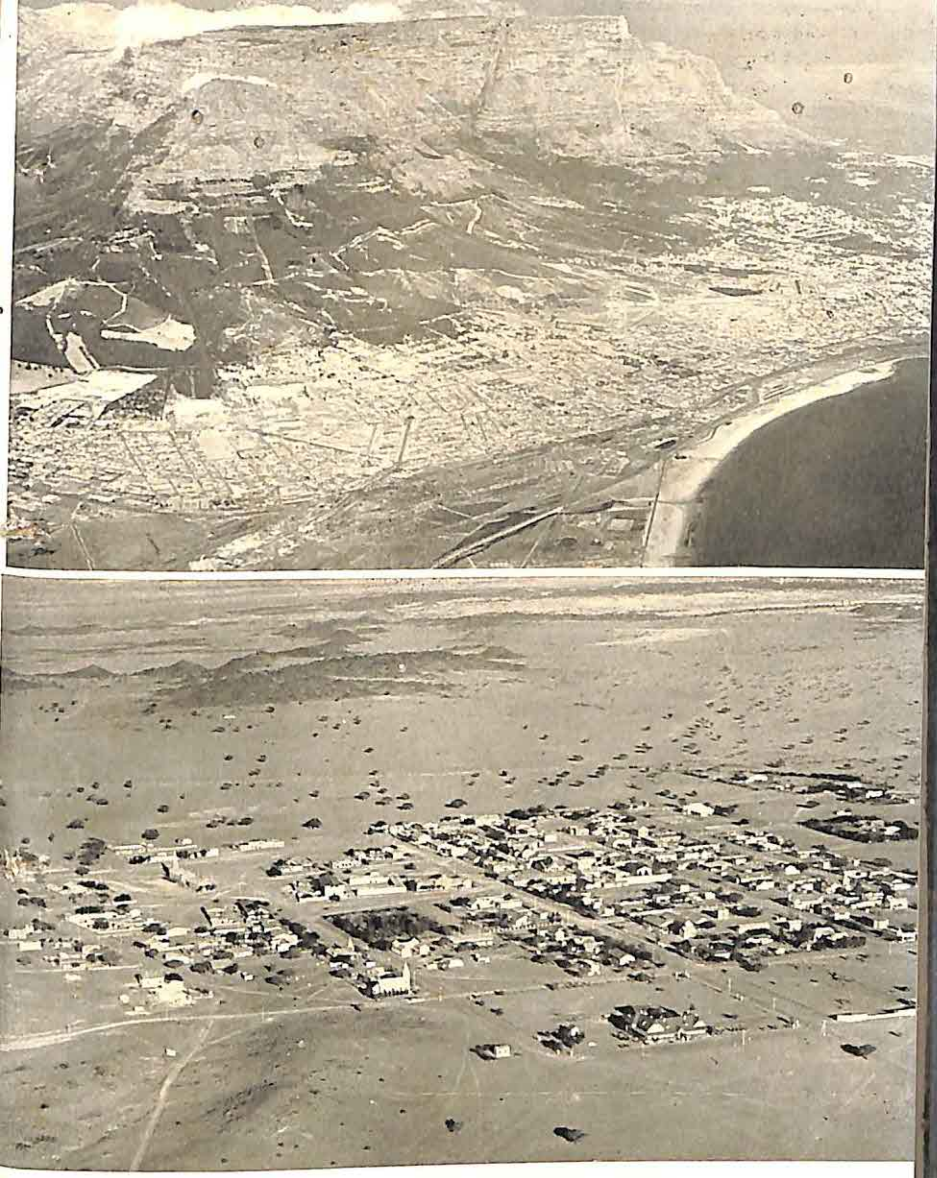
FIG. 223. South Africa: Minerals, Towns, and Railways.

Africa, where gold accounts for 90 per cent. of the value of the country's exports. The chief producing area is the *Rand* (Witwatersrand), a ridge in the south of the Transvaal forming the divide between the Limpopo and the Vaal. The metal is embedded in conglomerate rocks in such fine particles that it cannot be seen by the naked eye. After it has been hoisted to the surface it is crushed, ground by machinery, and chemically treated to obtain the gold. The mines extend for about 40 miles on both sides of Johannesburg, which is the centre of the greatest gold-producing area in the world.

Most of the world's *diamonds* come from South Africa. They are obtained from mines at Kimberley, and in alluvial diggings along the west coast, south of the mouth of the Orange River. *Copper*

is mined at *Messina*, just south of the Limpopo River. The Union has vast deposits of *coal*, not of the highest grade, but shallow, thick in seam, free from gas, and cheap to mine. The chief coal-fields are at *Witbank* (Transvaal), where there is a large thermal power-station which supplies the gold mines with electricity; and at *Vryheid*, in the north of Natal. There are enormous deposits of low-grade *iron ore* in the *Pretoria* district and even in the town itself. Some of this is used in the iron and steel works of the city, but more important is the high-grade haematite, mined in the Crocodile River valley, 93 miles north-west of Pretoria, where *Thabazimbi* (Native: *thaba* = mountain; *zimbi* = iron) is the principal centre. The mines are 'open-pit' workings. Coal is brought from Natal for smelting the ores, as Transvaal coal is not suitable for this purpose. In recent years large quantities of *manganese* ore have been mined at *Postmasburg*. The ore is exported through Durban, where there is a separate loading wharf for handling this valuable product.

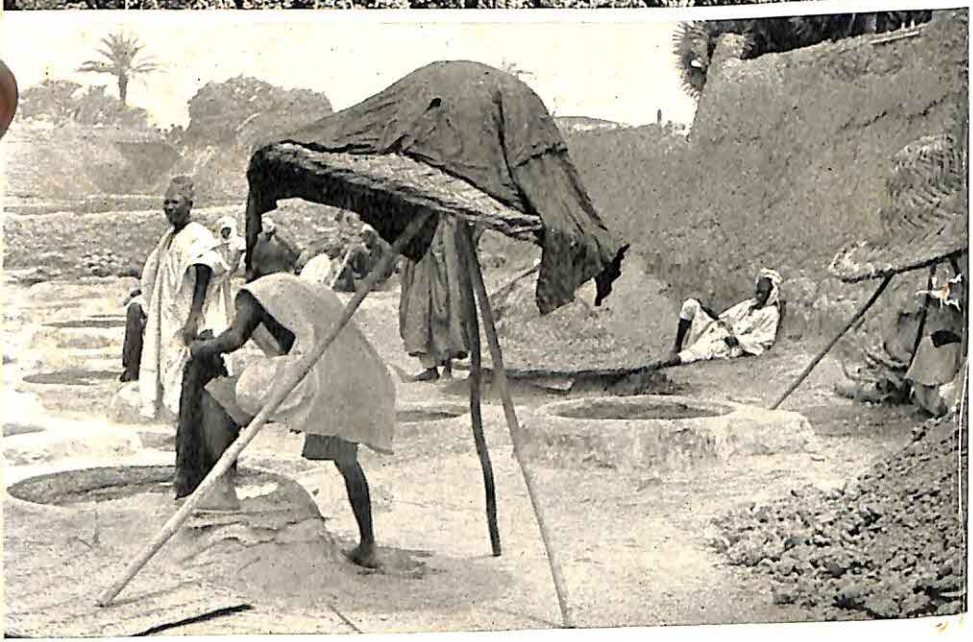
Communications and Towns. Owing to the configuration of the country the building of railways has been both difficult and expensive; and it is doubtful if many of the lines would have been constructed except for the valuable mineral resources. This is well illustrated by the fact that *Johannesburg* has become the focus of railways and roads from all parts of the Union. The main northward line from Cape Town climbs to the plateau, which it crosses in a north-easterly direction to De Aar, an important junction, where one branch runs south-east to Port Elizabeth and another north-west to connect with the South-West African railways. From De Aar it continues north through Kimberley to Mafeking and thence to Rhodesia and the Belgian Congo. This line, which was built before the Union of South Africa was established, does not pass through the Orange Free State and the Transvaal. From Mafeking, a line runs east and branches (*a*) north-east to Pretoria, and (*b*) south-east to Johannesburg. From the latter town the railway runs east through Germiston (an important junction, 9 miles from Johannesburg) to Witbank, near which it is joined by the line from *Pretoria*. From Witbank it continues east, through several coal-mining towns, and ultimately crosses the frontier and descends through *Portuguese E. Africa* to *Lourenço Marques*, an important outlet for the Transvaal. From Germiston another line runs south-east, through the Drakensbergs, and descending to the East Coast Belt passes through *Pietermaritz-*



Aerofilms Ltd.

33. SOUTH AFRICA

(*Above*) Capetown with the flat-topped Table Mountain in the background. A breakwate protects the harbour from the north-westerly gales blowing in from the Atlantic (see p. 377) (*Below*) A typical town on the High Veld. Note the rectangular layout and the residua ridges (rands, e.g. Witwatersrand—see p. 375) of old hard resistant rocks in the background



34. ZANZIBAR AND NIGERIA

(*Above*) Cloves and coco-nuts in Zanzibar which, with the adjacent island of Pemba, produces nine-tenths of the world's cloves. The clove-trees grow to a height of from 30 to 40 feet. The picking seasons are in May and September, the former being the principal one (see p. 361). (*Below*) Dyeing cloth with indigo in a pit at Kano, Northern Nigeria. Dyeing is an

burg, the capital of Natal, whence it continues to *Durban*, situated on a magnificent harbour. Durban is the busiest cargo port in the Union. It has a large coal export and bunker trade, and is the terminus of the British Overseas Airways Corporation route.

Cape Town ranks as the first port in the Union. It is the chief port of call for vessels using the 'Cape Route' from Europe and America to India, the Far East, and Australia. Many cargo liners follow this route to avoid the high dues levied on shipping passing

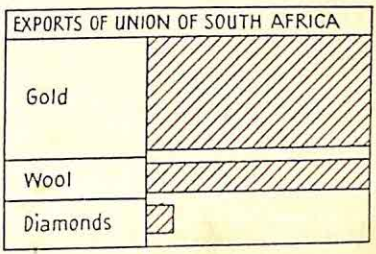


FIG. 224.

through the Suez Canal. Cape Town has a good harbour, sheltered by a breakwater, which protects it from the north-westerly gales which blow across the Atlantic in winter. It is the outlet for the surrounding 'Mediterranean' region and for the High Veld, more especially the southern portion. Hence its exports include not only fruits, but gold and maize. It shares with Pretoria the honour of being one of the two capitals of the Union.

South-West Africa (317,000 square miles), formerly German territory, is administered by the Union under a Mandate from the League of Nations. Owing to its dryness agriculture is impossible, except in some districts, and most of the country is a poor pastoral region where stock-farming is the main occupation. It includes within its borders part of the Kalahari, where live dwarf Bushmen, the most primitive race in South Africa. *Diamonds* are obtained from alluvial sources along a strip of coast stretching for 300 miles north of the mouth of the Orange River. In the north, copper is mined at Tsumeb. The only good harbour is *Walfish Bay*, connected by rail with De Aar. North of Walfish Bay is *Swakopmund*, whence a line runs inland to *Windhoek*, the capital of South-West Africa.

EXERCISES

1. Among the products of the Union of South Africa are sugar, wine, wool, and maize. Name *one* area important for each product, and describe briefly the geographical conditions that make each area named suitable for the production of the product.

2. Give an account of the railway system of the Union of South Africa (including South-West Africa), and show how the position and direction of the lines are related to (i) the relief, (ii) the mineral resources, and (iii) the position of the ports.

3. Draw sketch-maps to show the importance of (i) Cape Town as a port, (ii) Johannesburg as a route centre.

AFRICAN ISLANDS

No one approaching the African islands in the Atlantic can fail to be struck by their mountainous and rugged character. Many rise steeply from the ocean and culminate in cones which tell of their volcanic origin.

The Azores, lying some 750 miles west of Portugal, belong to that country, to which they export fruit and vegetables.

The Madeira Islands, some 450 miles west of Morocco, are also a Portuguese possession. Their equable climate favours the production of fruit, grapes for wine, and vegetables, and makes them a favourite tourist resort. *Funchal* is the capital.

The Canaries, a Spanish group, rising from the continental shelf of Africa, attain a height of over 12,000 feet in Teneriffe, the biggest island, on which is situated Santa Cruz, the capital. This port, like Las Palmas, the largest town on Gran Canaria, is a coaling-station.

The Cape Verde Islands (Portuguese) lie in the North-East Trade Wind Belt, about latitude 16° N. Though their climate is drier than the more northerly groups, yet they grow much fruit, together with some cereals and cane-sugar.

The British islands of *Ascension* and *St. Helena* lie in the mid-Atlantic. In the days of sailing-ships they were visited by vessels sailing before the south-east trades; and until the opening of the Suez Canal were still important calling-places for ships *en route* to India. On both islands are cable stations on the England to Capetown route, which also touches the Cape Verde Islands.

Madagascar, one of the largest islands in the world, is somewhat larger than France, to which country it belongs. It is separated from Africa by the Mozambique Channel, in places 10,000 feet deep, and 350 miles wide at its narrowest part. Physically the island is a detached portion of Africa and exhibits the same plateau-like configuration. The greater part is a table-land with an average height of from 2,000 to 3,000 feet, bordered by coastal plains. The bulk of Madagascar lies in the south-east trade wind belt, though in the southern summer, when the wind belts have shifted south, the north-east of the island comes under the influence of the north-east trades.

The tropical forests of the wet eastern lowlands are broken by plantations where rice, rubber, cacao, and sugar-cane are grown; while at higher elevations coffee and maize are cultivated. In the drier west the forests are more open, consisting of light tropical woodlands, savannas, and thornwoods. Many cattle are bred in the uplands, and meat-canning is an important industry. Antananarivo, the capital, in the centre of the island, is connected by rail with Tamatave, the chief port.

Mauritius, a British island three times the size of the Isle of Man, lies in the Indian Ocean 500 miles east of Madagascar. Cane-sugar, the most important crop, accounts for one-quarter of the total output of Africa. The greater part of the sugar grown in Mauritius is exported to the United Kingdom.

Two other British islands, *Zanzibar* and *Pemba*, lie off the coast of Kenya (see p. 361).

EXERCISES

1. Draw a sketch-map of Madagascar. (*a*) Shade the high land. (*b*) Show, by distinctive arrows, the direction of the prevailing winds in (i) January and (ii) July, and shade the area receiving the heaviest annual rainfall. (*c*) Print the names of *four* of the chief crops, each over one area, noted for its production. (*d*) Insert and name the capital and the chief port.

2. Give an account of the African islands belonging to Britain, and state, giving your reasons, which you think is the most important one.

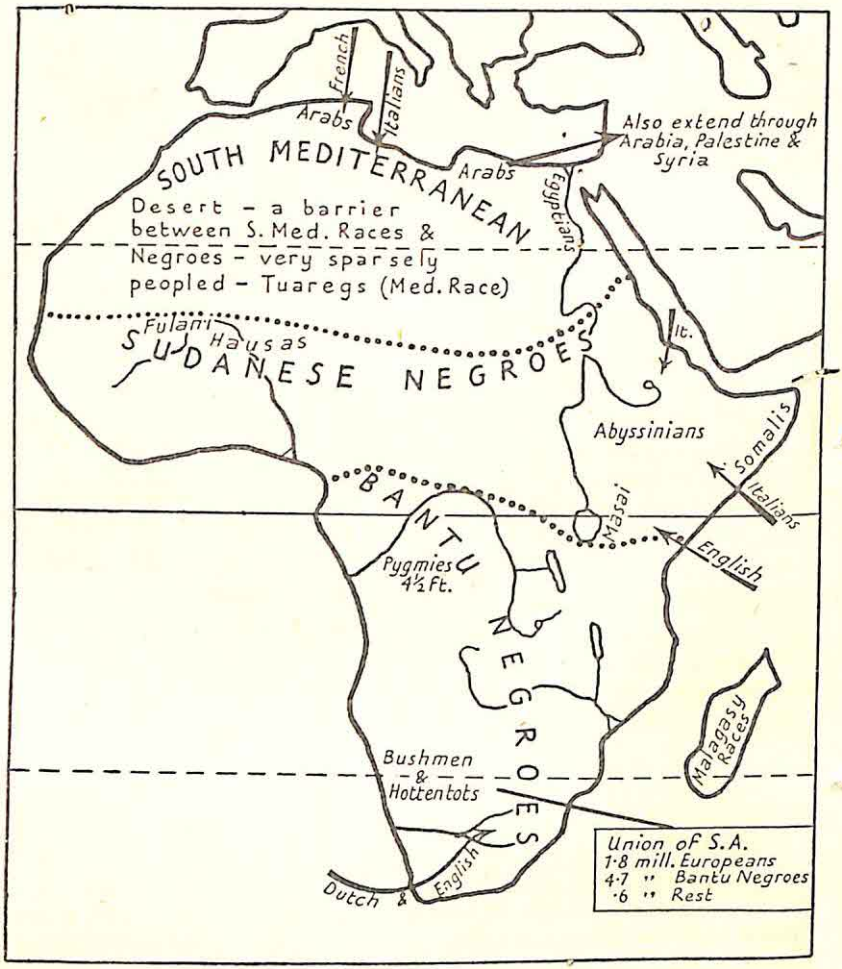


FIG. 225. Africa: Peoples.

PEOPLES AND DISTRIBUTION OF POPULATION

The peoples of Africa may be divided into three main groups.

The South Mediterranean Branch of the White Race are found mainly in Northern Africa. They include the Berbers, Arabs, and

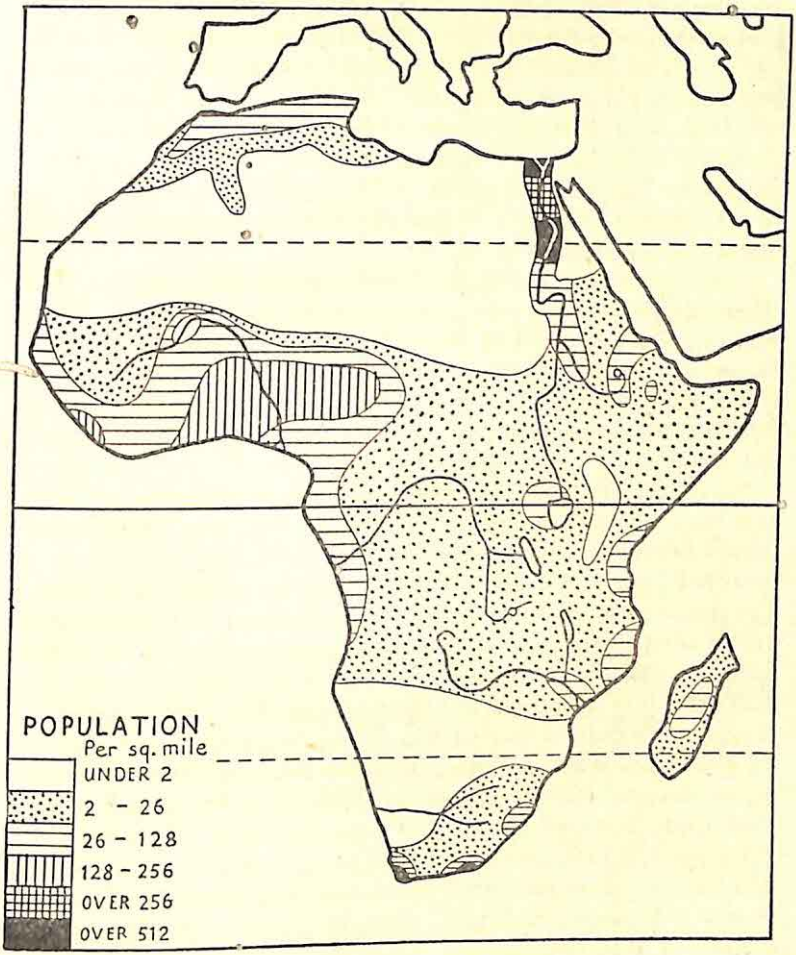


FIG. 226. Distribution of Population.

Egyptians, as well as those mysterious folk, the Tuaregs, who live in the Sahara.

The rest of the continent, apart from the comparatively few people of European origin, is inhabited mainly by negroes. On the southern and eastern margins of the Sahara, in the Upper Nile Valley, Abyssinia

and along the East Coast there has been a considerable admixture of negro blood with that of the Arabs and other South Mediterranean peoples. Though the typical negro is dark, with woolly hair, and of fine stature, yet some are lighter than others. There are two main divisions. The Sudanese Negroes who, as their name indicates, are found in the Sudan, are very dark brown, with thick lips, and broad flat noses. The Bantu Negroes, inhabiting that part of Africa south of the Sudan, are lighter in colour than the Sudanese, and their noses are usually less broad and flat.

Those primitive peoples, the dwarf Pygmies and Bushmen, have, like other weak races, been driven to take refuge in the less hospitable regions. Both are still in the collecting and hunting stage. The former are found in the heart of the Congo forests: the latter in the Kalahari. In this desert region live also the *Hottentots*, who are herders rather than hunters, and though of mixed origin are akin to the *Bushmen*.

No continent shows greater contrasts in the distribution of population than Africa. The desert regions of the Sahara and Kalahari are almost uninhabited, and only Egypt is really densely peopled. In the irrigated lands of the Nile valley and delta the number of persons to the square mile in many districts exceeds 1,000, but outside these fertile areas Egypt consists of almost uninhabited desert. The Atlas lands, owing to their climate, accessibility from the Mediterranean, and proximity to Europe, are fairly densely populated, containing a considerable number of people of European descent.

The Union of South Africa, despite its long association with Europeans, is comparatively sparsely peopled, for its dry climate does not encourage close settlement. The areas of densest population are in the coastal regions, notably round Cape Town, Port Elizabeth, and Durban, together with a small but thickly-peopled zone in the mining area of Johannesburg. Slightly more than 20 per cent. of the population are of European descent.

The comparatively sparse population of Equatorial Africa, which even in the highlands of Central Africa does not on an average exceed 14 persons to the square mile, is due partly to the past ravages of the slave trade and inter-tribal wars, and partly to the tse-tse fly which by spreading the deadly sleeping-sickness has caused whole areas to be depopulated. The Anglo-Egyptian Sudan, Nigeria, and the West Coast are, however, more thickly peopled. Nigeria has, on an average,

over 55 persons to the square mile, and in the Niger Basin the number is considerably greater, rising to over 250 to the square mile in some areas. The relative denseness in the forested area of Nigeria and the West Coast is largely due to the demand for tropical products which has led to the development of this region by Europeans. In Nigeria it should be noted that the main aim of the British Government, which is to encourage production and development by the native peoples, has on the whole been remarkably successful.

EXERCISES

1. Describe and account for the distribution of population in Africa, north of the Equator.

2. A traveller journeys from Alexandria up the Nile valley to Rejaf and thence to Banana. Describe his probable modes of transport and the types of people he would see.

TEST PAPER: AFRICA

PART 1

1. Select one of the following rivers—Nile, Niger, Congo—and discuss its importance to the people living along its banks.

2. What are the characteristic features of the Mediterranean type of climate? Name two regions in Africa with this type of climate. Describe the natural vegetation and crops of *one* of them.

3. Name *four* important food products, *two* minerals, and *two* raw materials (other than minerals) that Great Britain imports from Africa. Select *one* of these products, say how it is obtained, and describe the route by which it is transported to Britain.

4. Select *one* British possession in Tropical Africa and describe it under the headings: position, relief, climate, natural vegetation, crops, and communications.

5. (*a*) Give an account of the African peoples living south of the Sahara. (*b*) In what parts of Tropical Africa have white people made permanent homes? Why is Tropical Africa, as a whole, unsuited to white settlement?

PART 2

6. Describe the relief, climate, and natural vegetation of the country you would pass over in a journey by air from Cairo to Mombasa.

7. Draw a map of Africa to show the tropical forests and the savannas. Show how the native people in each region adapt their lives to their environment.

8. (*a*) How do you account for the fact that the Sahara Desert extends right across Northern Africa while the Kalahari Desert is limited to the west side of South Africa? (*b*) Account for the presence of oases in the Sahara, and discuss their importance.

9. Show how the development of mining has assisted the opening up of the Belgian Congo. Name the chief minerals obtained from this area and the regions where they are mined. Describe the route by which one important mineral is transported to the coast.

10. Select *four* ports in Africa and draw sketch-maps to show their position as regards land and sea routes. Show how the hinterland of each port has contributed to its importance.

PART 3

11. Compare the Suez and the Panama Canals (i) as regards their importance to the British Empire; and (ii) as regards world trade.

12. Compare the eastern coastal lands of South Africa (south of the Tropic of Capricorn) with the corresponding lands along the west coast, under the headings climatic conditions, natural vegetation, agricultural activities in relation to climatic conditions. Give a map showing (i) the relief, (ii) a line of longitude cutting each coast, (iii) the direction of the winds in summer, (iv) two ports on each coast, and (v) a railway serving each region.

13. (*a*) What European powers (apart from Britain) have colonies in Africa? Which power has the most extensive possessions in this continent? Select one of these powers (excluding Belgium) and discuss the importance to the homeland of its Colonial Territories in Africa.

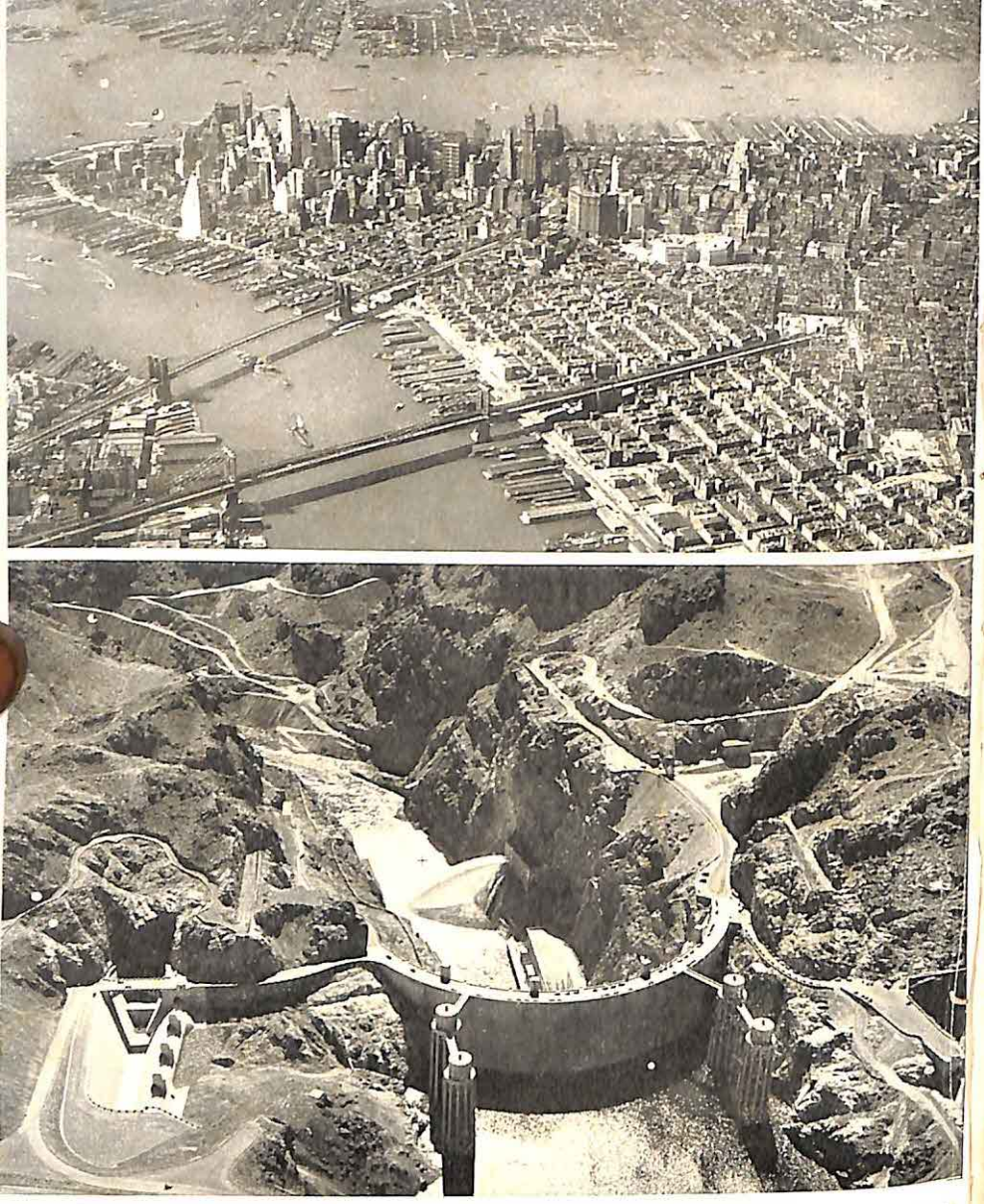
14. Draw a map of South Africa showing the chief Natural Regions. Print boldly the first letters of the following products over *one* area noted for each: citrus fruits, maize, sheep, cattle. Describe the farming activities in connexion with *one* of these products.

15. Name four animals indigenous to Africa, locate the chief regions in which they are found, and show how they are adapted to their environment.

35. THE ROCKIES AND THE MISSISSIPPI

(*Above*) Mount Assiniboine, one of the mighty peaks in the Canadian Rockies. (*Below*) Th
Mississippi at New Orleans where levees have been built to protect the city from the rive

(see p. 391).



36. NEW YORK AND THE BOULDER DAM

(*Above*) New York: the tip of Manhattan Island with the Hudson River in the background and the East River in the foreground. Note the skyscrapers (see p. 418). (*Below*) The huge Boulder Dam on the Colorado River, which will ultimately enable an area more than half the size of Wales to be irrigated. The fall of water at the dam will allow four times as much power to be generated as is produced by all the hydro-electric plants of the United States at Niagara. One of the power-stations can be seen on the right (see p. 426).

PART V

NORTH AMERICA

CHAPTER XXV

GENERAL SURVEY OF NORTH AMERICA

POSITION AND SIZE

With an area of 8 million square miles, North America is the third largest continent, ranking after Asia and Africa. The mainland extends from 70° N. to 10° N., or about 4,200 miles (1° = 70 miles approximately); but as the continent is roughly triangular in shape, by far the greater part lies in the temperate zone. The meridian of longitude 100° W. almost bisects it. North America is separated from Asia only by the Bering Strait, but 1,900 miles of ocean divide Newfoundland from Ireland. Though on the north America faces the Arctic Ocean, it also fronts the Atlantic and Pacific, and is favourably placed for trade with both Europe and Asia.

North America has not such an indented coast-line as Europe, but it has numerous openings. Chief among them are the St. Lawrence, leading to the Great Lakes; Hudson Bay, the Gulf of Mexico, and the Gulf of California.

The coasts vary greatly in character. From the St. Lawrence southward to Chesapeake Bay, the Atlantic coast is a sunken plain, where the mouths of the valleys have become drowned, forming deep and wide inlets at, or near, the head of which stand important ports. South of Chesapeake Bay a low coast, devoid of good harbours, margins a sandy plain. The Pacific coast is bordered by fold mountains, which form a barrier to communication with the interior. In Alaska and British Columbia a sinking coast is indented with fiords. From Puget Sound there stretches southward a straight rising coast, whose only really good harbour is San Francisco Bay.

STRUCTURE AND RELIEF

North America may be divided into four physical divisions: (1) the Canadian Shield, (2) the Appalachians, (3) the Western Cordilleras or Rocky Mountain System, and (4) the Central Plains.

(1) **The Canadian Shield,** which may be regarded as the core

of North America, extends in the shape of a huge V (Fig. 228) round Hudson Bay, stretching to the south of Lake Superior, and sending an arm westward almost to the Mackenzie River. Slow subsidence and

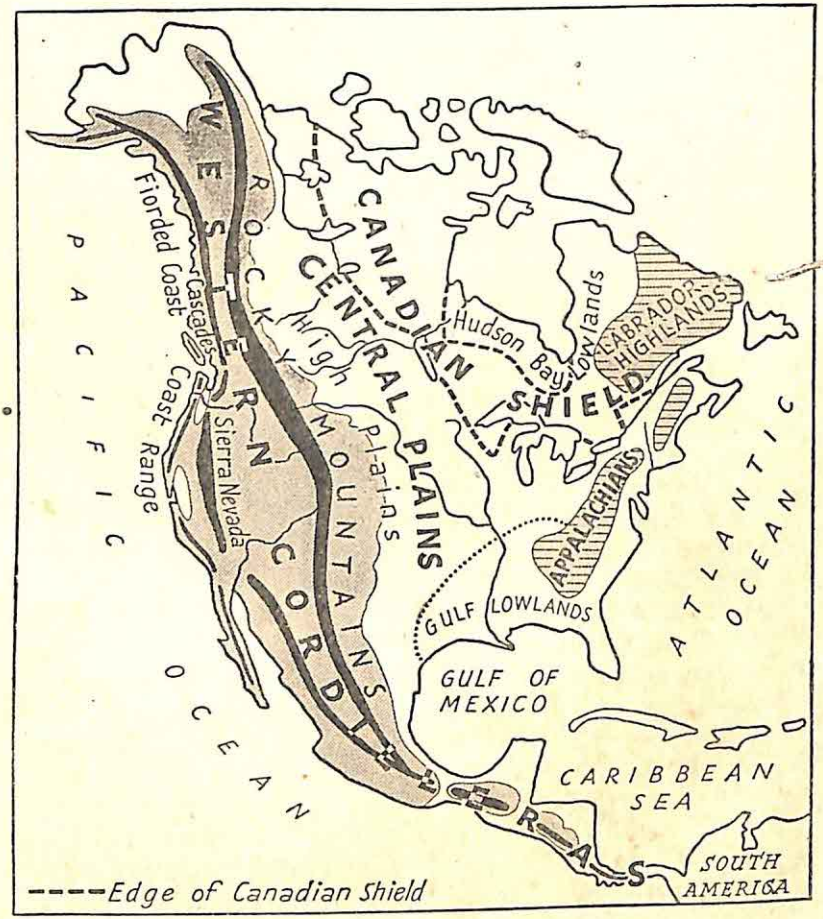


FIG. 227. North America: Physical Divisions.

erosion have reduced it to a peneplain which, however, rises in the Labrador Highlands to some 3,000 feet. Its ancient, hard crystalline rocks are rich in minerals, notably nickel, copper, and gold. The bedrock stands out as low ridges above the thin infertile soil. Many

valleys and hollows, dammed up by glacial debris, now form lakes, connected by streams, whose falls are used for power. The rugged undulating Shield differs little in elevation from the adjacent portions of the Central Plains, but it forms a distinct region, owing to its structure and resultant human activities.

(2) **The Appalachians** run from the St. Lawrence southward, roughly parallel to the east coast. They are the remains of ancient fold mountains, much denuded and changed by subsequent earth movements. North-east of the Hudson Valley they form the New England Highlands: to the south they are known as the Central and Southern Appalachians, a system of parallel ridges and valleys, broadest and highest in the mid-south. The Southern Appalachians sink on the east to the Piedmont Plateau, over whose scarped face rivers descend by falls to the Atlantic coast plain. The *Fall Line* so formed is important. The base of the scarp, marking the head of navigation, became a site for towns. The falls provide power.

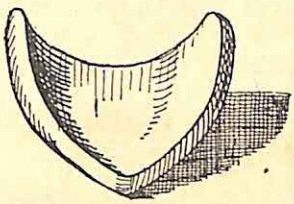


FIG. 228.

(3) **The Western Cordilleras or Rocky Mountain System** is more extensive and loftier, but of more recent geological origin than the Appalachians. The system extends for some 4,300 miles from Alaska southward to Central America, varying in width from 200 miles to about 1,100 miles. It consists of young fold-mountains, upfolded into three main ranges which, in the extreme south, taper to a single chain. The ranges are separated by longitudinal valleys or intermont plateaux. The system may be divided into five well-defined sections.

(*a*) *The Coast Ranges* extend from Alaska to the Peninsula of California. In British Columbia they are submerged, except where their higher portions stand out as islands, such as Vancouver Island. Farther south the Coast Ranges separate the Central Valley of California from the Pacific.

(*b*) To the east of the Coast Ranges is a series of valleys. In British Columbia these valleys are 'drowned', being represented by the channel running between the mountain wall of the continent and the island-fringe. They are continued by Puget Sound to the Great Pacific Valley and thence into the Central Valley of California.

(*c*) To the east of the depressions rise lofty ranges known in the north as the Alaskan Range, and farther south as the Cascade Mountains, the Sierra Nevada, and (in Mexico) the Western Sierra Madre.

FIG. 229. North America: Extent of the ice sheet during the Glacial period.

(*d*) A series of intermont plateaux, lying between these ranges and the main chain of the Rocky Mountains proper, includes the Yukon Plateau, the basaltic Snake River Plateau, the Great Basin of Inland Drainage around the Great Salt Lake, and the Colorado and Mexican Plateaux.

(*e*) Then come the *Rocky Mountains* proper. Their lofty peaks

dominate every landscape; and in the south majestic volcanoes, such as Orizaba and Popocatepetl, raise their snow-clad cones high above the Mexican Plateau.

(4) **The Central Plains** cover about three-fifths of North America. Of all the physical divisions of the continent they are at once the youngest and simplest in structure. They are floored with horizontal strata, whose sedimentary rocks were probably deposited on a deeply submerged portion of the Canadian Shield. It is possible to pass from the Arctic Ocean to the Gulf of Mexico without rising more than 1,000 feet. The level or undulating character of their surface is unbroken, except in a few cases where uplands occur, such as the Black Hills of Dakota, and the Ozark Hills between the Missouri and Arkansas rivers.

The plains may be divided into: (*a*) the *Northern Lowlands*, between the Shield and the Rockies, and drained to the Arctic by the Mackenzie; (*b*) the *St. Lawrence–Great Lakes Lowlands*; (*c*) the *Central Lowlands*, drained by the Mississippi, whose elevation is nowhere more than 600 feet, and which merge into (*d*) the *Gulf Lowlands* which, with the southern part of the *Atlantic coast plain*, form the *South-East Lowlands*; (*e*) the *High Plains*, stretching from the Central Lowlands towards the base of the Rockies.

THE ICE SHEETS

During the glacial period, great ice sheets spread over North America as far south as latitude 40° N. (Fig. 229). Even to-day the ice sheet has not entirely disappeared, for the greater part of Greenland, as well as a few small areas in Baffin Land, and Devon and Ellesmere islands, is buried beneath it.

The ice sheet did much to mould the surface of the land. It deposited debris as boulder clay and glacial drift which, on account of its wide range of origin, is varied in mineral content and usually forms a fertile soil. In mountain regions glaciers formed U-shaped valleys, and helped to shape the fiords along the Pacific coast. The interruption of drainage, due to the work of ice, resulted in the formation of lakes and falls that to-day provide power for generating electricity.

There were several glacial periods. In the final retreat of the ice the Great Lakes gradually became free, though their natural outlet through the St. Lawrence Valley was still blocked with ice. For a

time, the lakes drained to the Mississippi, then later by way of the Mohawk to the Hudson, whose glacier-formed valley is now such an important route. It was not until the Ice Age had finally passed that the Great Lakes were able to send their waters through the St. Lawrence into the Atlantic.

DRAINAGE

North America has a wonderful system of water-ways.

Pacific Drainage. The Yukon, rising in the north-west of the Western Mountain System, though 2,000 miles long, is relatively unimportant, as it is frozen for eight months in the year and flows westward through an almost uninhabited district. Farther south are the Skeena and the Fraser, whose valleys are followed by Trans-Continental Railways; the Columbia (1,400 miles) and its tributary the Snake (1,000 miles); and the Colorado, whose famous canyon forms a barrier to communications, but whose waters have been recently dammed for irrigation and power.

Arctic and Hudson Bay Drainage. The Mackenzie (2,500 miles) drains Lake Athabasca and the Great Slave and Great Bear Lakes. Like the Yukon, it suffers from the fact that it is only navigable for some four months each year. The Saskatchewan–Nelson (1,900 miles) is the chief river flowing into Hudson Bay: the Saskatchewan flows into Lake Winnipeg, the Nelson carries its drainage into the Bay.

Atlantic Drainage. Chief of all North American rivers flowing into the Atlantic is the St. Lawrence, which, with the Great Lakes, forms a water-way extending for 2,400 miles into the heart of the continent. Farther south relatively short rivers are important because their valleys form routes to the interior, and their estuaries provide harbours on which stand some of the chief American ports. Among these streams are the Hudson and its tributary the Mohawk; the Delaware; and the Susquehanna, the Potomac, and the James River, all three flowing into Chesapeake Bay.

Gulf Drainage. The principal river flowing into the Gulf of Mexico is the Mississippi (2,500 miles), whose basin covers one-third of the United States. After leaving Lake Itasca, a little to the west of Lake Superior, it flows for 400 miles through many small lakes and over numerous falls, of which the last and greatest are the Falls of St. Anthony, below which the river is navigable for small

vessels to the Gulf of Mexico. At St. Louis it receives from the Rockies the Missouri (2,450 miles), whose chief tributaries are the Yellowstone, Platte, and Kansas. Below St. Louis the principal tributaries of the Mississippi are the Arkansas and Red River, whose sources are in the Rockies, and the Ohio, which rises in the Appalachian Plateau.

At St. Louis the Mississippi enters its flood plain, which has a width of from 25 to 80 miles and is margined, in many districts, by bluffs from 200 to 300 feet high. Owing to the slight gradient the silt-laden Mississippi deposits much sediment on its bed. In its lower course the river now flows at a higher level than the surrounding country, which is protected from inundation by earth embankments, called levées. So enormous is the amount of sediment carried that the Mississippi has pushed its delta far out into the Gulf of Mexico.

The lower Mississippi and its tributaries, especially the Ohio, are subject to calamitous floods, whose effect is increased owing to the absence of lakes to act as reservoirs. The floods which occur in winter are often due to heavy rain in the north-west Appalachians; those of May to snows melting on the plains; and those of June to snows melting on the mountains and High Plains.

The Rio Grande (2,000 miles) is the only other large river flowing into the Gulf of Mexico.

CLIMATE

In considering the climate of North America the following factors should be noted: (1) Owing to the size of the continent, which extends from the Arctic Ocean into tropical latitudes, there are great varieties of climate with considerable differences of temperature between north and south. (2) Both the Rocky Mountains, and to a much lesser extent the Appalachians, prevent oceanic influences from the Pacific and the Atlantic Oceans respectively reaching the interior. On the other hand, the absence of mountains in the north allows cold winds from the Arctic region to travel far inland, and in winter their effect is sometimes felt as far south as the Gulf of Mexico. But, as if to compensate for this, the absence of a similar barrier in the south permits the moderating effect of the ocean (Gulf of Mexico) to be felt in the Lower and Middle Mississippi Basin.

Temperature. The *winter* isotherms run from west to east, bending south over the interior, which is colder than the coastal

regions. The January isotherm 32° F. shows that most of the northern part of the continent has a temperature well below freezing-point. The west coast is warmer than the east, for the prevailing south-west winds blowing from the Pacific raise its temperature.

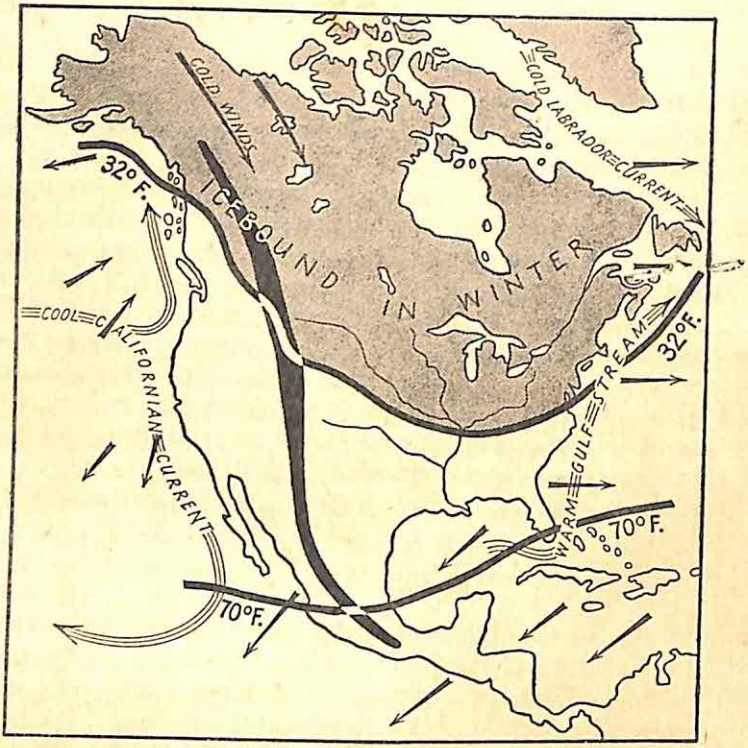


FIG. 230. North America: January Temperature.

Along the east coast the prevailing winds blow from the cold land interior, thus decreasing the temperature. Even in winter the Great Lakes, though frozen round their shores, have some moderating effect on temperature.

Note the effect of the ocean currents. In winter the warm Gulf Stream raises the temperatures along the south-east coast of the United States. The cold Labrador current lowers the temperature along the coast of Labrador; while the cool Californian current reduces temperatures along the west coast.

In *summer* the interior of the continent gains heat rapidly because the north to south mountain barriers, especially the Western Mountain System, shut out oceanic influences. The coastal regions are now cooler than the interior. The July isotherms are slightly convex

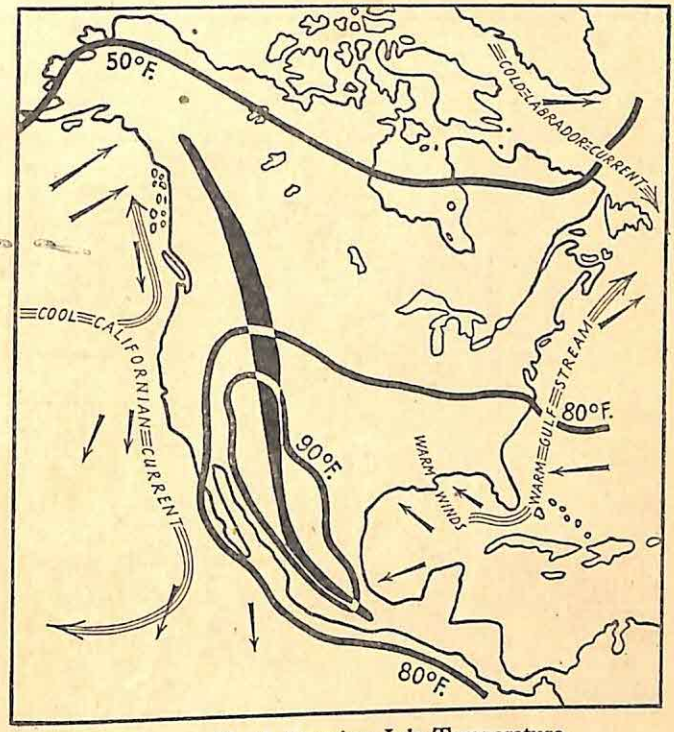


FIG. 231. North America: July Temperature.

towards the north, but the east coast is now warmer than the west. Along the northern part of the Pacific coast the on-shore westerlies are relatively cool, but along the east coast blow off-shore as warm winds. The Great Lakes exert a cooling influence. Note that the south of the continent, as well as the West Indies, has a July temperature of over 80° F., while in the south-west the temperature of the interior exceeds 90° F.

Winds and Rainfall. As the bulk of North America lies in the westerly wind belt there is, over the northern part of the continent,

AGRICULTURAL AND PASTORAL BELTS

In a continent so large as North America, there are vast areas where climate and relief vary little, and where the same kinds of crops can be grown. The chief agricultural and pastoral belts shown in Fig. 235 well illustrate the influence of climatic factors.

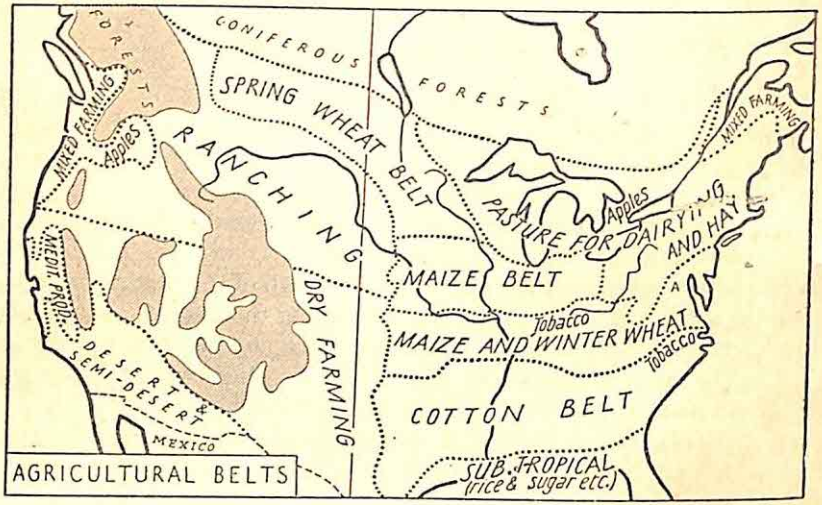


FIG. 235. North America: Agricultural Belts.

(1) *The Spring Wheat Belt* extends from Central Canada to the middle Mississippi. The winters are long and severe, the summers short but warm and sunny, and the rainfall is moderate.

(2) *The Maize Belt.* South of the spring wheat belt, the less severe winters, the longer and hotter summers, and the greater rainfall provide ideal conditions for the cultivation of maize.

(3) *The Maize and Winter Wheat Belts.* In this belt, as its name implies, the winters are sufficiently mild to allow autumn-sown wheat to survive the winter months.

(4) *The Cotton Belt* is bounded on the north by the invisible line marking the limit of *200 days free from frost*, and on the west, in general, by the meridian 100° W. beyond which the rainfall is insufficient for cultivation without recourse to irrigation.

(5) *The Sub-Tropical Belt*, fringing the Gulf of Mexico and

including the Peninsula of Florida, produces sugar-cane, rice, and warm temperate and sub-tropical fruits.

(6) *The Ranching and Dry Farming Belts* lie in the region of scanty rainfall stretching from longitude 100° W. to the Rockies.

(7) *The Dairy Pasture, Hay and Mixed Farming Belt* lies south of the coniferous forests in the region round the Great Lakes and extends north-eastward through the St. Lawrence Lowlands. The relatively damp climate favours dairying, and the many towns provide a ready market for produce.

(8) In *the Mediterranean Region* of Central California enormous quantities of warm temperate fruits and vegetables are grown on irrigated lands.

(9) In *Mexico and Central America* the type of cultivation depends mainly on altitude.

PEOPLES OF NORTH AMERICA

When the first Europeans reached America they found it inhabited by copper-coloured people, with straight black hair, broad cheeks, and long, well-shaped noses, to whom they gave the name of *Red* Indians. These people were at various stages of culture: some were merely food-gatherers or hunters, but others practised simple agriculture. Apart from some districts along the north coast of North America, where lived Eskimos, possibly of Mongolian origin, these so-called Indians were spread through both the Americas. At first they received the white men kindly, but later there was constant strife between the two races and the Indians steadily decreased in numbers. To-day in Canada and the United States large reserves have been set aside for the Indians, where they can follow their traditional occupations. Much is also being done to educate them and improve their health and general well-being.

It was not until about a century after the time of Columbus that Europeans began to make their homes in the northern continent. French pioneers settled along the St. Lawrence estuary, where their descendants still live to-day; the Dutch established themselves at the mouth of the Hudson, the British around Chesapeake Bay and in other districts between the Appalachians and the Atlantic coast. Meanwhile French colonists, who had penetrated up the Mississippi Valley, tried to prevent the English settlers along the coast from spreading into the fertile plains to the west. The French lost their

possessions in Canada, which were surrendered to the English a few years after Wolfe's victory at Quebec (1759). Some twenty years later, the thirteen English colonies along the Atlantic seaboard won their independence and formed the nucleus of the United States.

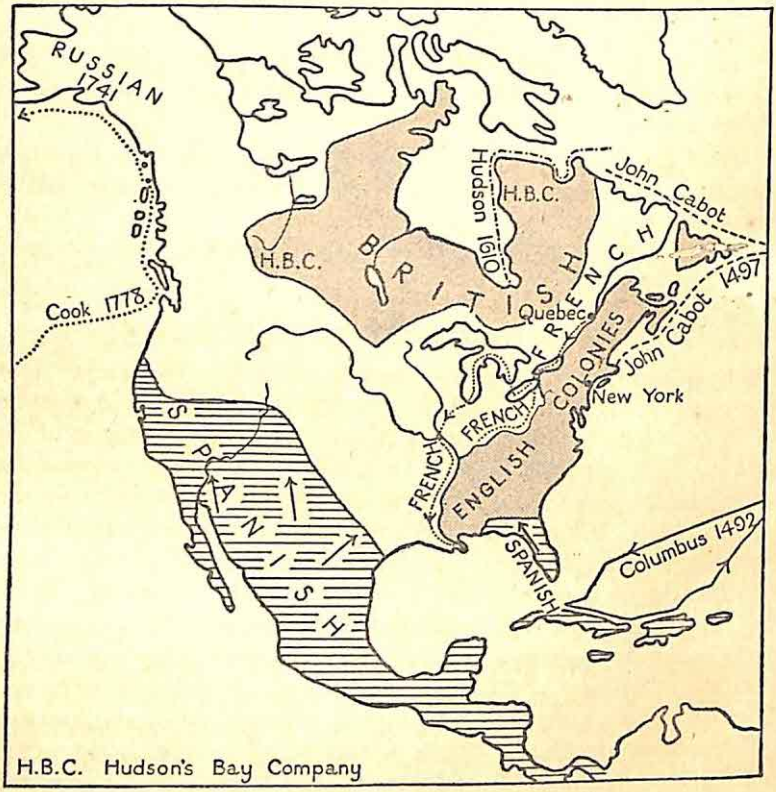


FIG. 236. North America: Early Exploration.

The Spaniards, seeking gold and precious stones, turned their attention to Mexico and Central America, where the majority of the people are of mixed Spanish and Indian descent; while the whites are mainly of Spanish origin.

Emigrants from all the countries of Europe subsequently settled in North America, especially in Canada and the United States, where, with English as their common tongue, two great nations live side

by side. In both countries, especially along the Pacific coast, there are a number of Japanese and Chinese; while in the south of the United States live some 12,000,000 Negroes who, like most of the inhabitants of the West Indies, are descendants of former slaves brought from Africa to work on American plantations.

EXERCISES

1. Illustrating your answers by diagrams, where necessary, and giving examples from North America, (i) state how *fold-mountains*, *residual mountains*, and *peneplains* are formed. (ii) What do you understand by an alluvial plain? Of the above types of land-forms, state which you would expect to be most thickly peopled and why.

2. On a sketch-map of North America, (i) shade the land over 3,000 feet; (ii) insert and name the Rockies, Appalachians, and Plateau of Labrador; (iii) name the St. Lawrence and insert and name the five Great Lakes; (iv) insert and name six of the chief rivers in addition to the St. Lawrence; (v) mark and name the Tropic of Cancer and longitude 100° W.

3. (*a*) What effect have the Rocky Mountains on the climate of the Central Plains? (*b*) How does the absence of mountain barriers on the north and south of North America affect the climate of the Interior Plains in (i) winter, and (ii) summer?

4. The climatic data below refer to Port Simpson (B.C.), San Francisco, and Winnipeg. State, giving your reasons, to which town each refers, and classify the climate of each as Maritime, Continental, or Mediterranean.

Town	*Coldest Month*	*Hottest Month*	*Rainfall*	
			Nov.–Apr.	*May–Oct.*
A	34° F. (Jan.)	57° F. (Aug.)	41 in.	40 in.
B	−3·5° F. (Jan.)	66° F. (July)	6 in.	14 in.
C	50° F. (Jan.)	59° F. (Sept.)	21 in.	2 in.

5. On a sketch-map of North America, insert and name the chief belts of Natural Vegetation. In the case of *one* of these belts, state briefly the relationship between the natural vegetation and climate.

6. (*a*) Give an account of the peoples living in North America at the time it was first discovered by European explorers. (*b*) What peoples, other than native inhabitants and those of European descent, are now found in North America? Account for their location in those areas in which they are chiefly found.

CHAPTER XXVI

CANADA AND NEWFOUNDLAND

NEWFOUNDLAND

NEWFOUNDLAND, Britain's oldest colony, lies at the entrance to the St. Lawrence. Its rugged coasts are cut by many inlets and pierced by long winding fiords. The chief wealth of the island lies in its forests, fisheries, and iron mines. Pine, spruce, birch, larch, and other softwoods cover about one-quarter of the interior, yielding timber for pulp, which is manufactured into paper at Cornerbrook and Grand Falls, where the waters of the Middle Exploits river provide power.

South and east of Newfoundland the broad Continental Shelf, covered with comparatively shallow water, forms the *Grand Banks*, one of the chief fishing grounds in the world. The cold Labrador Current brings diatoms and other food suitable for fish. The chief catch is cod, which form 80 per cent. of the fish exports, but hake, halibut, and herring are also caught. Much dried cod is sent to Brazil, the West Indies, and the Catholic countries of Southern Europe; cod-liver oil is also an important export. *St. John's*, the capital, is a centre for sealing-vessels, which in early spring hunt for seals on the ice-floes. Seal-fat yields oil used in making soap; the skins are tanned for leather. Much of the iron-ore mined at Bell Island, in Conception Bay, is sent for smelting to Sydney, Cape Breton Island.

CANADA

With an area of $3\frac{1}{2}$ million square miles, Canada is the largest single state in the British Empire, but though nearly thirty times the size of the British Isles its population (10 millions) is less than one-quarter that of these islands. Why has this vast Dominion so relatively small a number of inhabitants? In part, because the North-West Territories and Yukon (comprising somewhat more than one-third of Canada) are climatically unsuited to close settlement: in part, because Canada is a 'new' country. It is true that Quebec was colonized by the French early in the seventeenth century; and that some hundred and fifty years later, when Canada passed to Britain,

Ontario received many settlers from the home country and the United States, yet in spite of this early colonization it is only during the last century, and more especially during the last fifty years, that Canada has been steadily opened up. The year 1885, when the Canadian Pacific Railway was completed, may be regarded as marking the beginning of an era of expansion. The construction of this transcontinental line made possible the development of the prairies, and by linking Eastern Canada with British Columbia strengthened the ties between these widely separated regions. So rapid has been the progress of the Dominion in the present century that between 1901 and 1931 the population doubled itself. In the latter year, out of a total of 10,300,000, some 8,000,000 were Canadian born, and of this number 5,300,000 were of British origin and nearly 3,000,000 of French descent. Apart from about 129,000 Indians and Eskimos and a number of Japanese and Chinese, the remaining inhabitants (about 1,800,000) are chiefly of European stock. Its wonderful resources of timber, grain, and cattle, of minerals and hydro-electric power, which are being developed by an amazingly vital people, make Canada a land of great potentialities, and one that will ultimately be able to support a far larger population than at the present time.

Canada may be divided into six regions: (1) the Maritime Provinces; (2) the St. Lawrence–Great Lakes Lowlands; (3) the Coniferous Forest Belt; (4) the Prairie Provinces; (5) the Arctic Region; and (6) British Columbia, comprising (*a*) the Rocky Mountain system and (*b*) the Pacific Fiorded Coastal Region.

(1) The Maritime Provinces. The Maritime Provinces are *Prince Edward Island*, the smallest but most densely peopled province in Canada; *New Brunswick*, and the peninsula of *Nova Scotia*, in which province is included Cape Breton Island. Somewhat isolated from the rest of Eastern Canada, the Maritime Provinces belong to the same natural region as the adjacent New England Region of the United States.

The chief occupations are fishing, mixed farming, lumbering, and mining. The damp climate favours dairying and the growing of cool temperate fruits, especially apples, for which the Annapolis Valley, on the east side of the Bay of Fundy, and that of the St. John river (N.B.) are noted. Dairying and poultry farming are especially

important in Prince Edward Island. New Brunswick is noted for lumbering. Nova Scotia is the leading *coal-mining* province in Canada, accounting for some 40 per cent. of the Dominion's output. The chief mines, near *Sydney*, in Cape Breton Island, are close to the coast, thus facilitating export, and the import of ore from Newfoundland for iron smelting. The ice-free ports of *St. John* and *Halifax* are terminal ports of the Canadian Pacific and the Canadian National Railways respectively.

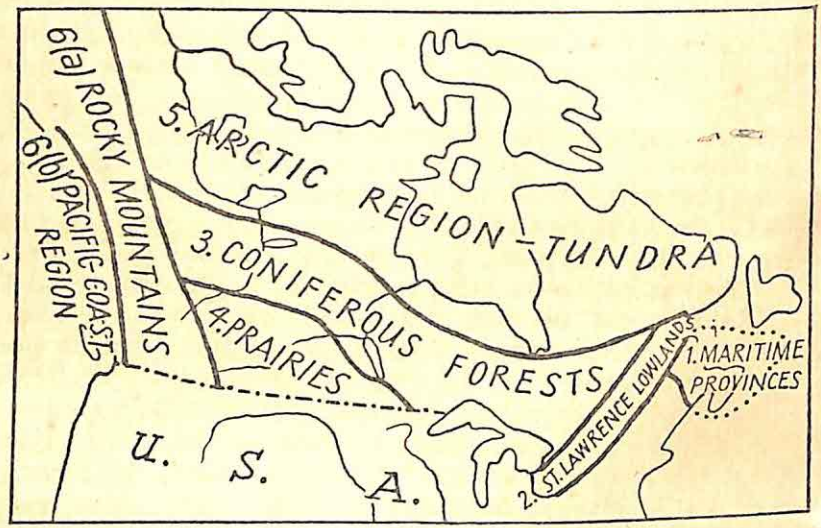


FIG. 237. Canada: Regions.

(2) **The St. Lawrence–Great Lakes Lowlands.** The St. Lawrence Lowlands are level plains lying between the rugged forested lands of the Canadian Shield and the Northern Appalachians. They are covered with thick glacial drift, whose sandy and clayey soils form excellent agricultural land. Parts are still wooded, but outside the urban areas mixed farming predominates, the growing of oats, hay, potatoes and other root crops being closely associated with stock-rearing. Somewhat more than half the dairy cows, sheep, pigs, and poultry, and nearly half the beef cattle in Canada, are found in the two provinces of Quebec and Ontario. On many farms vetches, clovers, and green maize are stored in silos for food during the winter, which is too severe for stock to remain out of doors. Dairying has

the advantage of a ready market close to hand, and an overseas market in England, which obtains more cheese from Ontario than any country. The Lake and Niagara Peninsulas are noted for fruit farming, as well as tobacco, which is grown along the shores of Lake Erie.

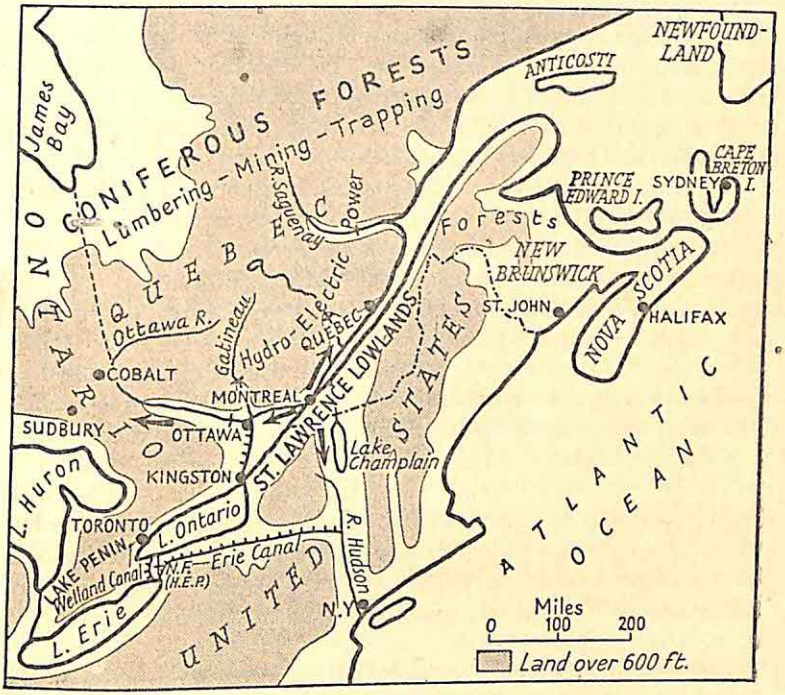


FIG. 238. Eastern Canada.

Canadian manufactures owe their rapid development, since the beginning of the present century, almost entirely to cheap hydro-electric power, to plentiful supplies of raw materials close at hand, and to advantageous shipping facilities to local and world markets. South of the Great Lakes lies the most densely peopled area in the United States, which supplies the St. Lawrence Lowlands with coal, and in return takes agricultural produce, minerals, and newsprint. The above factors, supplemented by adequate rail and road transport, and protective tariffs, have played an outstanding part in transforming

the littoral region, stretching from Lake Ontario to Quebec, into one great manufacturing area. Thus it is not surprising that the St. Lawrence Lowlands, comprising little more than one-tenth of Canada, contain over 60 per cent. of the population, and five of the Dominion's largest towns.

Montreal (820,000), on an island in the St. Lawrence, about 1,000 miles from the open Atlantic, stands at the head of navigation and also commands important land routes. It is the chief port of Canada and one of the greatest grain-exporting ports in the world. It manufactures machinery, rolling-stock, boots, paper, and clothes. *Ottawa* (126,000), the Dominion capital, is a saw-milling, pulp, and paper manufacturing centre. *Quebec* (130,000), a terminus for the larger ocean liners and the chief French-speaking town in Canada, is noted for its paper-, cotton-, and woollen-mills. *Toronto* (630,000), on Lake Ontario, the chief manufacturing town in Canada, makes agricultural machinery, packs food products, and has large foundries. Its trade has greatly benefited by the opening of the new Welland Canal, which enables vessels plying on the Great Lakes to reach the city from Lake Superior. *Kingston*, with railway works, and *Hamilton* (155,000), with shipyards, have likewise benefited by the facilities provided by the canal.

(3) **The Coniferous Forest Belt.** The greater part of this belt lies within the Canadian Shield, whose old crystalline rocks weather to form scanty infertile soils. This rugged region is a land of extractive industries, rich in timber, minerals, water-power, and fur-bearing animals, but thinly peopled.

Canada's forests cover an area nearly eight times that of the British Isles, about half of which is capable of yielding commercial timber. The trees are mainly coniferous softwoods—black and white spruce, red and white pines, cedar, and balsam firs—though in the south-east of the Shield and in the Maritime Provinces deciduous hardwoods, such as beeches, oaks, and maples, are found. In the forests of Eastern Canada, the first to be exploited, the supply of trees like white pine, suitable for sawn timber, is approaching exhaustion. This is largely due to felling, but also to forest fires, which do incalculable damage. To combat such fires, steel look-out towers, linked by wireless and telephone, have been erected at convenient spots; while an increasing use is being made of aircraft for

fire detection. The present timber output of Eastern Canada consists mainly of spruce and balsam firs, whose logs provide excellent material for the pulp and paper industries.

In some of the more accessible districts timber is now felled throughout the year, but the main lumbering season is in winter, for the frozen state of the ground facilitates transport, making it easy for the logs to be hauled, by horse-drawn sledges or motor tractors, to the nearest shoot, down which they slide to the banks of a stream to await the spring thaw. The lakes act as collecting basins where logs are assembled before being floated farther down stream to the saw-, pulp-, and paper-mills, whose machinery is driven by electric power.

For centuries hunting animals for furs has been a winter occupation in the forests. Much trapping is still carried on, and there are also fur farms, where animals are reared for their skins. Montreal, Winnipeg, and Edmonton, together with New York, St. Louis, and London, are the world's leading fur markets.

With the exception of coal, the crystalline rocks of the Canadian Shield are rich in minerals, notably nickel, copper, gold, and silver. The chief copper-nickel mines are at Sudbury, Ontario, which, in addition to their output of copper, supply 85 per cent. of the world's nickel. Platinum and allied metals are found in association with the nickel-copper ores. Canada ranks second to the Union of South Africa as a gold-producing country. Four-fifths of her supply is obtained from Ontario, where the principal mines are at Porcupine and Kirkland Lake. Asbestos is mined at Thetford in Quebec Province.

Many of Eastern Canada's saw-, pulp-, and paper-mills, mines and factories could not be profitably worked without the cheap *water power* supplied by harnessing the many falls of the Shield and its margins. The use of hydro-electricity halves the power costs of manufacture. The water-power resources of the Dominion are unsurpassed by those of any other country except the United States. The southward-flowing rivers of the Shield descend into the St. Lawrence Valley by falls, whose waters are used by numerous power-stations. The greatest power development in Canada, that of the Niagara River, lies somewhat outside the actual Shield area. Ontario shares with its neighbour, New York State, the resources of this mighty torrent, which carries the drainage of four of the five Great Lakes.

(4) **The Prairie Provinces.** From the Red River Valley the treeless, level, or undulating prairies slope gradually upwards towards the Rockies. They consist of three steps rising one above the other by low escarpments. The first, called the Manitoba Lowland, is a level plain with an average elevation of 800 feet. The second, a more undulating region, stretches from Manitoba into Saskatchewan, rising on the west to 1,600 feet. The third step, which has a still more diversified surface, spreads through Alberta to the foot-hills at the base of the Rockies, where it attains an elevation of 3,000 feet.

The heavy black soil, rich in humus, the winter snows, the showers of late spring and early summer coupled with brilliant sunshine, and the relative flatness of the country, which permits the use of large-scale machinery, have made the prairies one of the leading cereal-growing areas in the world. Wheat, oats, and barley are the chief grain crops, and of them all wheat takes pride of place. In Manitoba, the first province to be opened up, mixed has replaced one-crop farming, and the growing of cereals and root crops is now combined with stock-farming and poultry-keeping.

On the prairies ploughing starts soon after the melting snows have moistened the ground. The seeds, sown by means of drills drawn by horses or tractors, are planted in the latter part of April. The ground is then harrowed, a process that tends to lessen evaporation and conserve the moisture in the soil. Growth is rapid. The crops usually head out by the middle of July and are ready for cutting a month later. Self-binders and reapers and still more modern machines called combines are used for harvesting. After the grain is threshed it is taken by wagons or motor-lorries to country elevators beside the railways to await dispatch. In the season 1935–6, out of every 100 bushels of wheat exported from Canada, 24 were dispatched through Vancouver, 32 by way of the Great Lakes–St. Lawrence, and 2 through Churchill on Hudson Bay. Some is sent to Buffalo, on Lake Erie, and thence by rail to New York for export.

In those parts of Saskatchewan and Alberta where the rainfall is light, many cattle, horses, and pigs are bred. In Alberta conditions are specially favourable for ranching. This is due to the excellent grazing land among the foot-hills of the Rockies, and to the Chinook winds, caused by air that descends from the Rockies becoming heated in contraction. In autumn these warm dry winds turn the standing grass into 'prairie hay': in winter they melt the

snow, and so make the grass available for stock which are able to remain out of doors at this season. Round Calgary, Lethbridge, and Medicine Hat, cereals, flax for linseed, sugar beet, and alfalfa are widely grown, and farther north the Peace River district is being opened up.

Alberta is the only prairie province with developed mineral resources. Lignite is mined near Calgary, bituminous coal near the

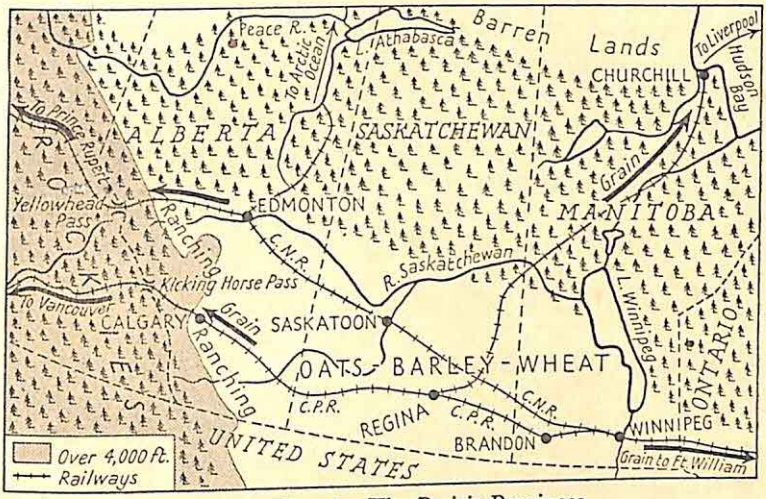


FIG. 239. Canada: The Prairie Provinces.

Crow's Nest Pass, and gold at Goldfields. Petroleum and natural gas are obtained at Medicine Hat and other places in Southern Alberta. The recently developed oil-field in the Turner Valley, near Calgary, has proved to be the largest source of crude oil in the British Empire.

In the prairie provinces the population varies from 1 to 3 persons per square mile, the most thickly peopled belts lying near the railways. *Winnipeg* (220,000), at the confluence of the Red River and the Assiniboine, is one of the foremost wheat centres in the world. It mills flour, makes farming machinery, and cans meat. *Calgary*, commanding the route through the Kicking Horse Pass, is a distributing centre, as, too, are *Regina*, the capital of Saskatchewan, and *Saskatoon*. From *Edmonton*, capital of Alberta, and airport for the North-West and Yukon, a line runs to Waterways, the railhead, on the Athabasca.

(5) **The Arctic Region.** This region, extending from northern Quebec westward to the Rockies, consists of vast moss-grown tundra, which stretch from the stunted woodlands margining the coniferous forests to the Arctic Ocean. Though the *North-West Territories* and *Yukon* have an area of nearly 1½ million square miles, their combined population does not exceed that of a fair-sized town. The Indians and Eskimos hunt and fish, but domesticated reindeer have been introduced from Alaska with a view to encouraging the latter to become also herdsmen. Fur-trapping and trading are still the main occupations. Yet the rocks of the Canadian Shield, which extends to the Mackenzie Basin, are rich in gold (Yellowknife), silver, copper, and pitch-blende ores. Steamers ply on the Athabasca and Mackenzie rivers, and aeroplanes, based on Edmonton, are widely used for transport, carrying passengers, mining machinery, and ore concentrates, such as radium-bearing and silver ores, which in winter are sometimes conveyed by plane from Eldorado mines east of Great Bear Lake to smelters at Port Hope, Ontario.

(6) **British Columbia.** The fiorded coast of British Columbia is separated from the open Pacific by an island-fringe. Between the ranges of the Western Cordilleras lie plateaux and upland valleys, above which jagged peaks tower over glaciers and snow-fields. The prevailing south-west winds cause a heavy rainfall along the seaward slopes of the ranges, but the interior plateaux and valleys are drier, though plentifully supplied with water, for they are irrigated by snow-fed streams. We may divide British Columbia into two regions: (1) the Rocky Mountains and (2) the Pacific Fiorded Coast Region.

(1) In the *Rocky Mountains* lumbering and mining are the main occupations, though farming is carried on in valleys, like those of the Okanagon and Kootenay districts, which are famed for their apples. Magnificent forests clothe the lower slopes of the mountains. At lower levels grow Douglas firs, Sitka spruces, and other gigantic conifers yielding valuable timber, but the smaller trees found at higher elevations are only fit for pulpwood. Rivers provide transport for logs and power for electricity, but in many districts, owing to the rapidity of the streams, timber is hauled by light railways, or motor tractors. In numerous areas lumbering continues throughout the year.

British Columbia ranks after Ontario as the chief mining province of Canada. Coal is worked near Fernie, west of the Crow's Nest Pass,

and also near Nanaimo, on the south-east coast of Vancouver Island. Copper is mined at Britannia Beach on the Pacific coast, and, with lead and zinc, in the Kootenay district. The ores are concentrated locally, and then sent to Trail, where there are smelters, refineries, and metallurgical works, supplied with coal from Fernie, and electric power from plants on the Kootenay River. Gold is mined in the north of British Columbia and in the Yukon.

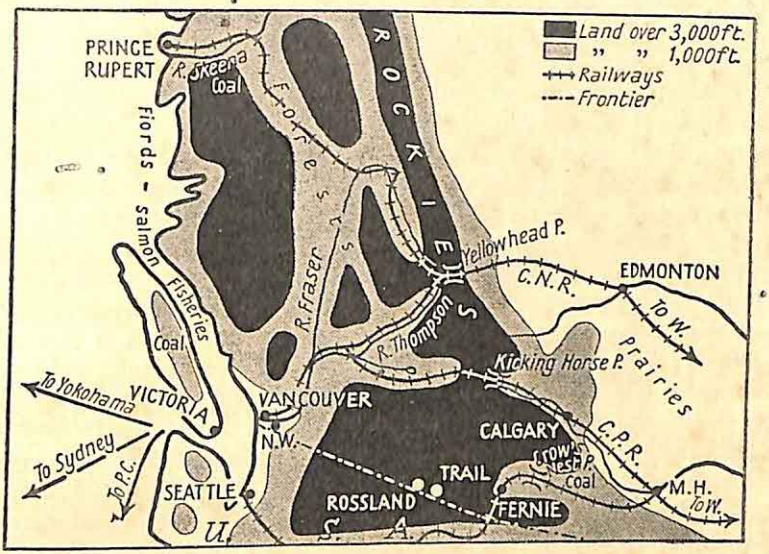


FIG. 240. British Columbia: Routes across the Rockies.

(2) *The Pacific Fiorded Coastal Region.* The salmon fisheries of British Columbia, together with those of Alaska and the north-west of the United States, are the most valuable in the world. Deep-sea fishing, of which Prince Rupert is the main centre, has become important in recent years. Agriculture, for local needs, is carried on in the lowlands and the adjacent valleys.

The majority of the people of British Columbia live in the few towns, most of which are ports. Communication between the towns and fishing villages is carried on by steamer, for there are no railways running along the fiorded coasts, though Vancouver is a terminal port for the Canadian Pacific and the Canadian National Railways

and *Prince Rupert* also for the latter. *Vancouver* (250,000), situated a little north of the mouth of the Fraser River, has a growing trade in the export of wheat and timber. In the neighbourhood are saw- and pulp-mills, and salmon canneries as, too, are there at *New Westminster*. *Victoria* (40,000), the capital of British Columbia, is situated in the extreme south-west of Vancouver Island, a well-forested area.

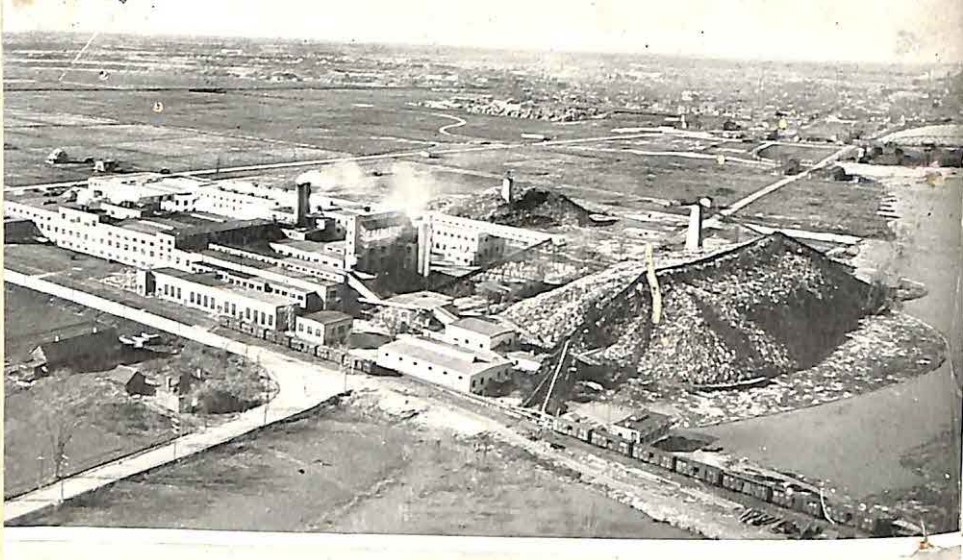
(7) **Communications.** The *St. Lawrence and the Great Lakes*, the chief inland water-way in the world, link the grain areas of the prairies and the iron-ore district of Minnesota (see p. 418) with the industrial regions of Eastern Canada and the United States. Rapids are avoided by canals. Of the three *Sault*, or *Soo* Canals, linking Lake Superior with Lakes Michigan and Huron, the largest and most used is in the United States. The Niagara Falls are avoided by the Welland Ship Canal, opened in 1931, with a depth of 30 feet, which allows it to take the largest vessels plying on the Lakes. The canals cut to avoid the St. Lawrence Rapids, between Lake Ontario and Montreal, only allow the transit of relatively small ships. The main disadvantages of the St. Lawrence–Great Lakes water-way are that it is blocked with ice in winter, when the whole of the traffic is by rail; and that frequent fogs near the mouth of the St. Lawrence hinder shipping.

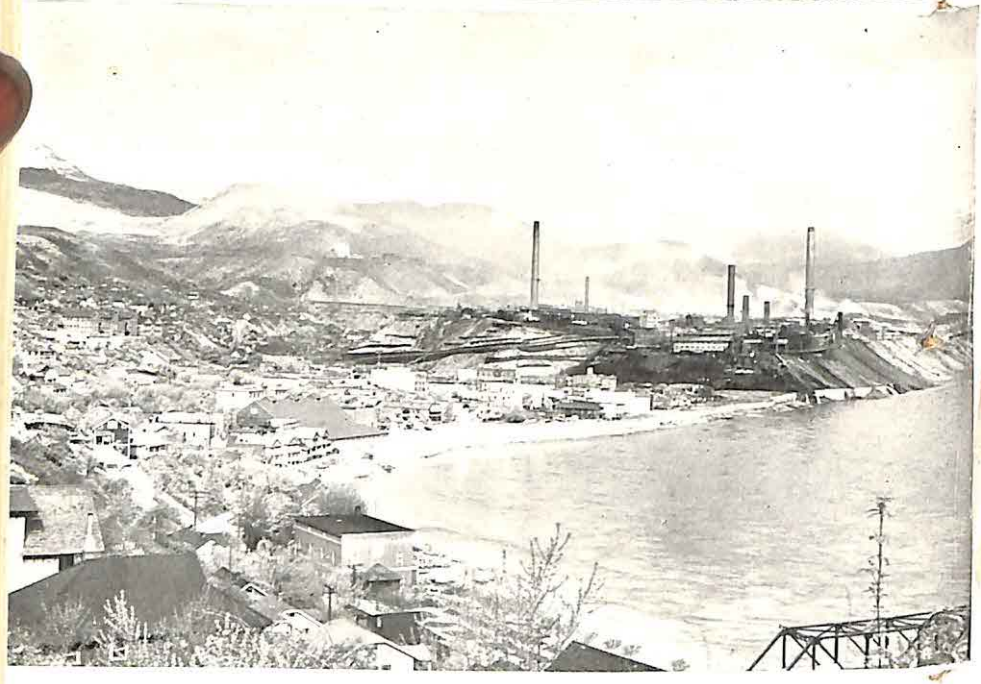
There are 42,000 miles of railway in Canada. Two transcontinental lines, with many branches, link Eastern Canada with the Pacific, the east to west journey taking about five days. The *Canadian Pacific Railway* (*C.P.R.*), runs from St. John (N.B.) through Montreal to Ottawa. Thence it passes through Port Arthur–Fort William to Winnipeg, and after traversing the southern prairies, crosses the Rockies by the Kicking Horse Pass, and descends by the Thompson and lower Fraser Valleys to Vancouver. The *Canadian National Railway* (*C.N.R.*) includes within its system a number of formerly independent lines that have been taken over by the government. Its eastern terminus is Halifax: its Pacific ones, Vancouver and Prince Rupert. In general it follows a more northerly route than the C.P.R. All parts of the Dominion are linked by air.

Trade and Commerce. *Exports.* The exports of Canada fall into four main groups, given here in order of value. (1) Food products, including wheat, flour, cheese, fish, and meat; (2) Forest products, including wood-pulp, planks, boards, paper, and newsprint, whose value exceeds that of timber and wood-pulp combined;

37. THE CANADIAN SHIELD AND NIAGARA

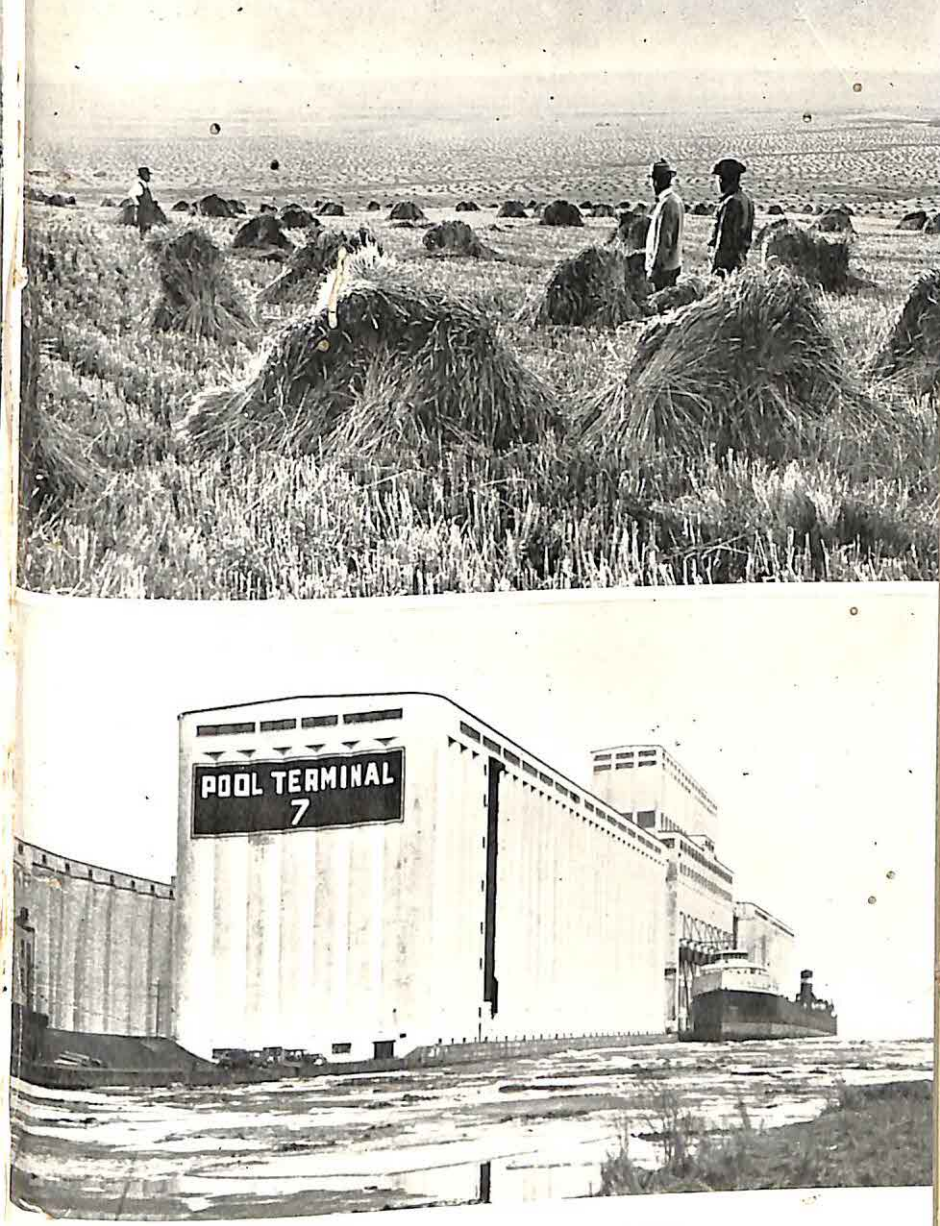
(*Above*) The Canadian Shield between the Great Slave and the Great Bear Lakes. The photograph was taken by the author from an aeroplane at a height of 5,000 feet. The rounded hills, varying in height from 300 to 1,000 feet, are covered with a scanty soil sheet of glacial drift. The hollows are filled with lakes which spill from one another by short streams. In parts, 75 per cent. of this area consists of water. Scanty coniferous





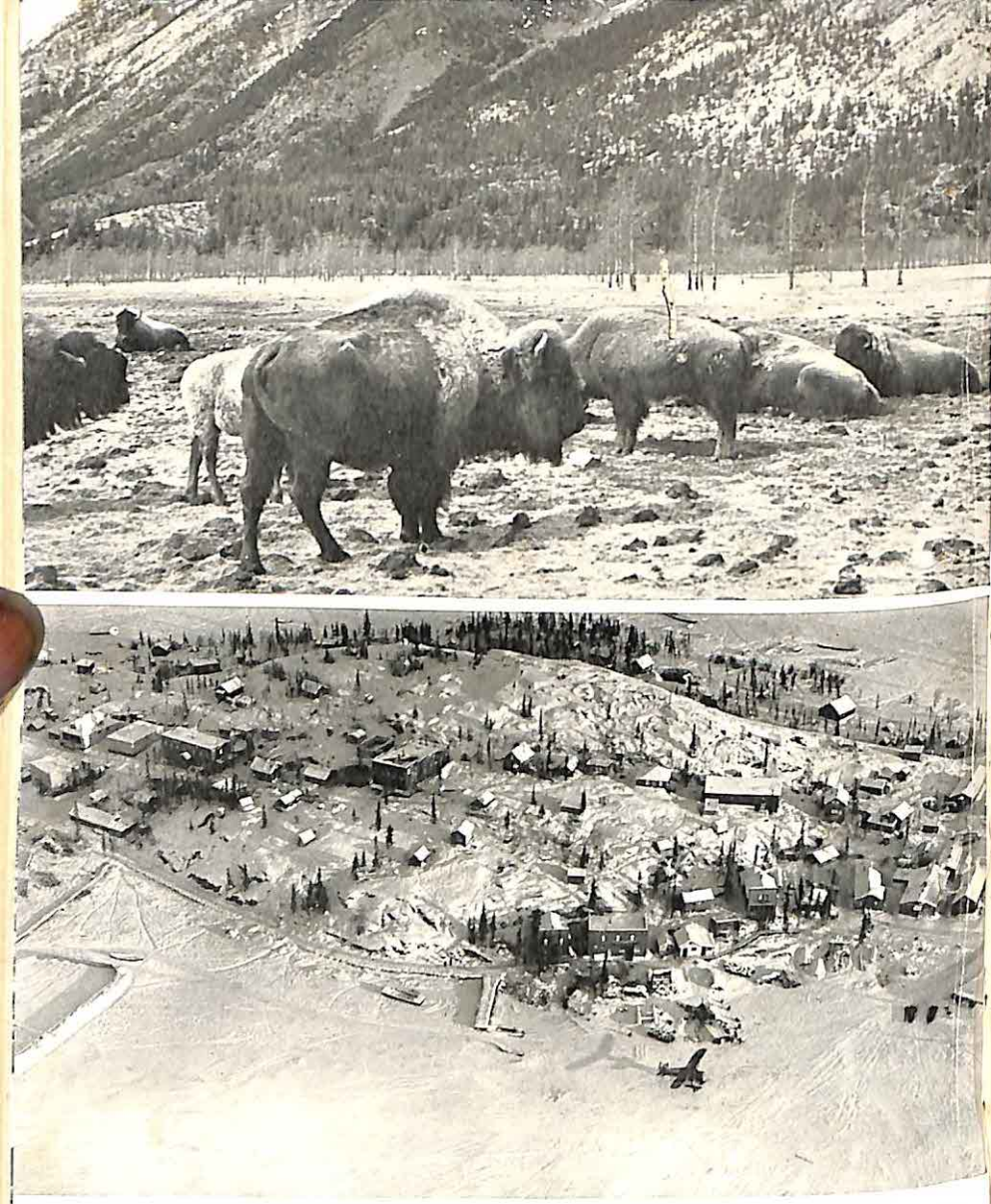
38. TWO OF CANADA'S RESOURCES

Above) A Paper Mill at Three Rivers, Quebec. The pile of pulp-wood on the right has been fted by a conveyor ready to be transported to the mill when required. (*Below*) A general iew of Trail, B.C., situated on the Columbia River. The chimneys of the huge smelter of the Consolidated Mining and Smelting Company may be seen on the right. The surrounding ill-sides are practically devoid of vegetation, but much has been done in recent years to



39. THE WHEATLANDS OF CANADA

(*Above*) A general view of the wheatlands of the Canadian Prairies. The photograph show
the rolling nature of the country. The valleys are wooded. (*Below*) The first steamer t
arrive at Port Arthur–Fort William, in May 1939, after the 'break-up' of the ice on th
Great Lakes. Note the masses of floating ice. The vessel is being loaded with wheat a



40. A NATIONAL PARK AND AN ARCTIC MINING CENTRE

(*Above*) Bison in the Rocky Mountains National Park. The photograph was taken near Banff by the author. The total area of the National Parks of Canada exceeds 10,000 square miles, of which Jasper alone covers 4,400 square miles. In these reservations nothing is allowed to mar the scenic grandeur, and the natural vegetation and wild life are preserved. (*Below*) Yellowknife, a gold-mining centre on the Great Slave Lake. The photograph was taken in January 1938. Waterways, the railhead, is over 300 miles away, but there are regular air services

(3) Minerals, exported mainly in semi-manufactured form, e.g. copper bars; and (4) Wholly manufactured goods, such as motor-cars, machinery, and paper (see 2).

Imports. The imports of Canada show the influence of a number of factors, among them being (*a*) her position in north temperate latitudes; (*b*) her relative lack of coal, iron, and petroleum; (*c*) her membership of the British Commonwealth of Nations; and (*d*) her proximity to the United States. Thus Canada's imports include tropical and sub-tropical products, such as cotton, rubber, sugar-cane, and bananas.

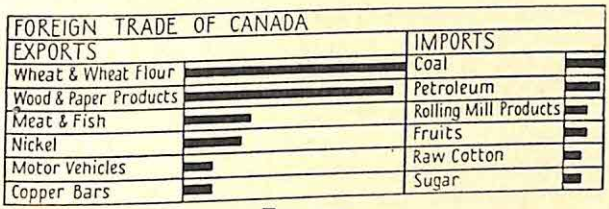


FIG. 241.

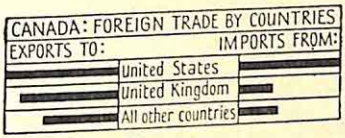


FIG. 242.

Mineral imports include iron ore obtained from the United States and Newfoundland, and petroleum, the bulk of which comes from the former country. Iron and steel goods and coal are obtained mainly from the United States and Great Britain: British coal may be regarded as a return cargo for bulky commodities like wheat. Other Canadian imports from Britain include textile goods.

The United States and Britain are the Dominion's best customers. But as regards imports Canada purchases from the United States goods whose value is about three times that of those supplied by Britain.

EXERCISES

1. Give an account of the St. Lawrence Lowlands, describing their natural resources, industries, and chief towns.

2. Contrast Vancouver and Halifax with respect to (i) climate, (ii) access to hinterland, (iii) position for trade, and (iv) nature of trade.

3. Give an account of the distribution of water-power in Canada, and show its influence on the industries of the Dominion.

4. Show how the commercial development of Canada has been assisted or retarded by (i) relief, (ii) rivers, and (iii) natural vegetation.

5. Write an account of British Columbia under the headings: relief, climate, farming activities, fishing, mining, communications, and towns.

6. Give an account of the distribution of population in Canada, noting the geographical factors that have influenced that distribution.

7. Under the following headings write an account of cereal production in Canada: relief and soils; climate; season and methods of sowing, harrowing, and harvesting; transport to railway and markets.

8. Give an account of the import and export trade of Canada, paying special attention to the trade of the Dominion with (i) Great Britain and (ii) the United States.

9. The table below gives the distances and the scheduled times taken by *Trans-Canada* air liners flying from Montreal to Vancouver:

	Distance	*Scheduled time*
Montreal–Ottawa	110 miles	0 hour 50 minutes
Ottawa–North Bay	197 miles	1 hour 25 minutes
North Bay–Kapuskasing	268 miles	1 hour 45 minutes
Kapuskasing–Winnipeg	667 miles	4 hours 20 minutes
Winnipeg–Regina	333 miles	2 hours 05 minutes
Regina–Lethbridge	367 miles	2 hours 20 minutes
(*Lethbridge, junction for Calgary and Edmonton, airport for North-West Territories*)		
Lethbridge–Vancouver	469 miles	3 hours 00 minutes
Montreal–Vancouver	2,411 miles	15 hours 45 minutes

(*a*) With the aid of your atlas describe the kind of country you would fly over in travelling from Vancouver to Montreal. Illustrate your answer by a sketch-map. (*b*) If a liner leaves Montreal at 9 p.m., at what time will it arrive at Vancouver? (*c*) A liner from Vancouver arrives at Montreal at noon; at what time did it leave Vancouver?

CHAPTER XXVII

THE UNITED STATES

THE area of the United States, excluding Alaska and her overseas possessions, is almost 3 million square miles. But though the size of the Republic is somewhat less than that of Canada, its population is twelve times as great. Out of 122 million people, the majority are of European descent. Though mainly of British and Irish stock, they include representatives of every country in Europe, more especially of Germany, Poland, Russia, and Italy. There are 12 million Negroes, about a third of a million Indians, residing mainly on reservations, and a number of Japanese and Chinese, found principally along the Pacific seaboard.

The most thickly peopled area is the north-east, partly because of its proximity to the Atlantic seaboard and the Great Lakes, and partly on account of the Pennsylvanian coal-field. The mountain states are the most thinly peopled (see Fig. 256).

Regions of the United States. We may divide the United States into the following regions: (1) the North-East States, which may be subdivided into (*a*) New England and (*b*) the Central Appalachians and their margins; (2) the Central Lowlands; (3) the South-East Lowlands; (4) the High Western Plains; (5) the Rocky Mountains and Plateaux; (6) the Pacific States, which may be subdivided into (*a*) the North-West States (Oregon and Washington), and (*b*) California (Fig. 243).

(1) The North-Eastern United States. (*a*) *New England.* In its relief, indented coast-line, and climate New England resembles the adjacent Maritime Provinces of Canada. A rather inhospitable interior led the early settlers to supplement farming by fishing and shipbuilding, for which ample supplies of timber were available. They also made cloth from local wool, first in their homes and later in mills, using direct water-power. These activities led to an accumulation of capital which, coupled with initiative and inherited skill, gave the New England people a lead in the Industrial Revolution.

In the northern states, fishing, farming, and lumbering are still the leading occupations. Boston and Gloucester are leading fishing-

centres. *Portland* (Maine), a terminal port of the C.P.R., has a considerable export trade in timber. Mixed farming is the rule. Dairy produce, fruit, and vegetables find ready markets in the urban areas.

The south of New England is largely industrial. The early woollen industries paved the way for cotton manufactures with raw material from the Southern States. Modern textile centres are situated either

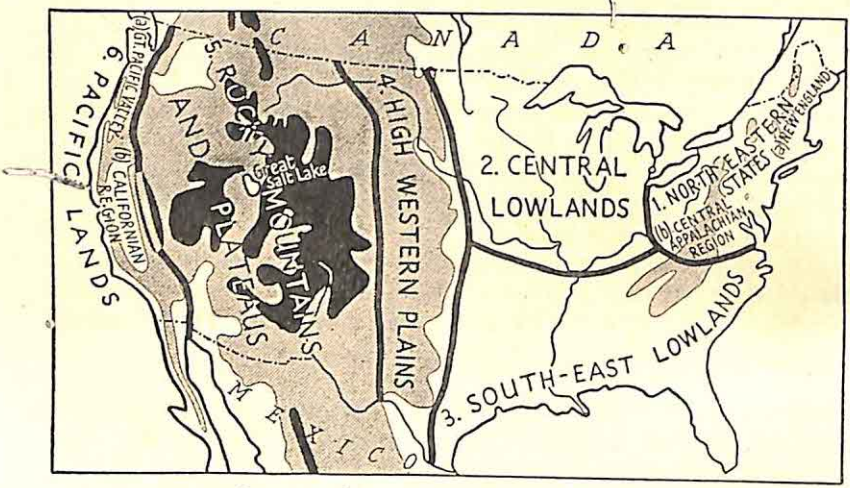


FIG. 243. United States: Chief Regions.

at ports where they can obtain cheap water-borne supplies of coal, or within easy reach of hydro-electric power. *Providence* (R.I.) and *Lawrence* make woollen goods. The latter town, like *Manchester* and *Lowell* also on the Merimac, is one of the leading cotton manufacturing centres, as, too, are *Fall River* and *New Bedford* (Mass.). New England specializes in fine cotton goods, which need less raw material but more skilled labour than the coarser cottons made in the South Atlantic States. Other industries, where skilled labour is more important than raw material, include the manufacture of clocks and watches at Waltham and Waterbury, and light metal goods at *Springfield* and other centres in the Connecticut Valley, where, too, are a number of towns engaged in manufacturing paper with local and imported wood-pulp. Boots and shoes are made round *Boston* (780,000), the chief port, commercial, and distributing centre in New England.

(*b*) *The Central Appalachian Region* extends from the Atlantic seaboard, across the Appalachians, to Lakes Erie and Huron. A number of routes link the ports and towns of the seaboard with those of the trans-Appalachian section. Of these, the most important is the Hudson–Mohawk Valley, leading northward to the St. Lawrence and westward to the Great Lakes. Other, but more difficult, routes

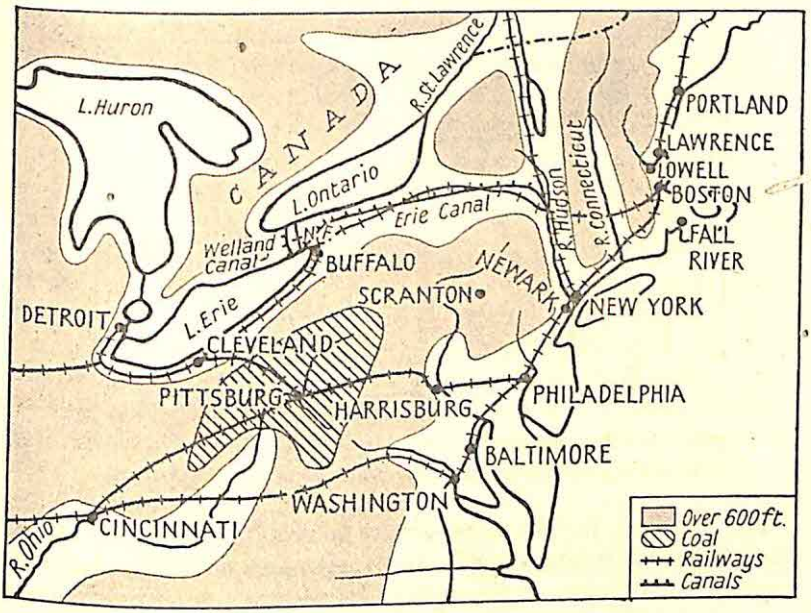


FIG. 244. United States: North-eastern States.

follow the valleys of the Delaware and Susquehanna to the Harrisburg Gap and so to Pittsburg; the Potomac to the Cumberland Gap, and the James river. All are traversed by railways, but with the exception of the Hudson route all are handicapped by very heavy gradients which add to transport costs.

The United States produces about one-third of the world's *coal.* Of this amount more than half is obtained from the *Appalachian Coal-field* stretching from northern Pennsylvania along the Appalachians to Alabama. This area includes the *Pennsylvanian* and *West Virginian* fields. As throughout this region the rivers have cut deep valleys into the horizontal coal seams, galleries can be run into

the mines from the sides of the valleys, thus making it unnecessary to sink shafts. Most of the coal is of a bituminous (soft) type, which is easily mined by machinery and cokes well. Anthracite is, however, found in North-East Pennsylvania. Though vast amounts of coal are required for the many industries, especially for smelting iron ore, much is exported from Cleveland and other ports on Lake Erie, while West Virginian coal is sent by rail to Newport News for export by sea.

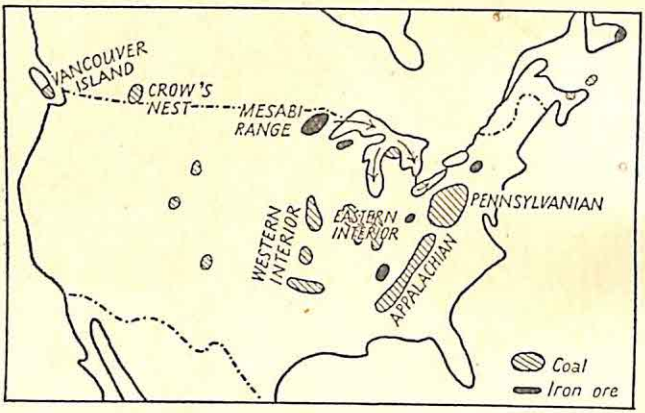


FIG. 245. United States: Distribution of Coal and Iron.

The presence, in relative proximity to coal, of iron ore and limestone did much to make the Pennsylvanian area one of the foremost *iron-smelting* districts in the world. Local supplies of iron ore are now almost exhausted, and the bulk comes from the open-pit mines in Minnesota, especially from the *Mesabi Range*, which produces one-quarter of the world's iron ore. The range lies 100 miles north of Duluth, from which port ore is shipped (i) to Chicago and Gary on Lake Michigan, where it is smelted with coke from the *Illinois–Indiana Coal-field*; or (ii) to *Cleveland* (900,000) and *Buffalo* (570,000) on Lake Erie, whose smelters are supplied with coal from the Pennsylvanian field. From Cleveland much ore is sent by rail to *Pittsburg* (670,000), which still remains the largest steel centre in a country whose output of pig-iron and steel exceeds that of any other in the world.

New York (7,000,000), situated on Manhattan Island between the Hudson and East Rivers, has a splendid harbour sheltered by Long

Island. It owes much of its importance to the fact that the Hudson–Mohawk Valley is the only lowland route from the Atlantic seaboard of the eastern States to the interior. New England and the lowlands to the south are to no small extent tributary to New York, but the great city is linked by the Hudson–Mohawk route with a vast and rich hinterland which includes the Pennsylvanian industrial area and the region served by the Great Lakes. It is not surprising that with these advantages New York has become the chief port of the United States, its leading banking and commercial and one of its principal manufacturing centres. Its industries are too numerous to specify, but they include the manufacture of clothing, furniture, and tobacco.

Philadelphia (2,000,000) stands at the head of ocean navigation on the Delaware River. As the chief seaport for the Pennsylvanian coal-field, it exports coal and steel, while its close connexion with the coal-field is further emphasized by its foundries, shipyards, and railway works. Petroleum is pumped for hundreds of miles to its oil refineries, and copper is sent from the western mining states, the Keweenaw Peninsula, and also from Chile and Peru (via Panama) to its copper refineries. On the Potomac arm of Chesapeake Bay stands *Washington*, the capital of the United States: on the northern arm of the bay is *Baltimore* (820,000), whose trade and industries are very similar to those of Philadelphia. *Richmond*, on the James River, is an important tobacco market and exporting port.

(2) The Central Lowlands. The Central Lowlands, which form part of the great interior plains of North America, lie wholly in the basin of the Mississippi. The primary business of this region is farming. The area as a whole is well wooded and in the north there are still extensive forests. The presence of coal, petroleum, and natural gas, together with water-power, has given rise to a number of industries associated with the forest lands and the farms. Thus, Saginaw and Grand Rapids (Michigan) have both large furniture factories supplied with local and imported timber, and with power derived by harnessing falls.

The chief crops are wheat and maize, but mixed farming is also important.

Wheat is sown both in spring and autumn. The *spring wheat belt* extends from the Middle Mississippi north-west into Manitoba. Flour-milling is carried on throughout the wheat belt, but the chief

centres are the twin cities of St. Paul and Minneapolis, whose mills derive their power from the St. Anthony Falls. Oats and barley are also grown in the spring wheat belt, as, too, is flax, produced for its seeds, from which linseed oil is obtained.

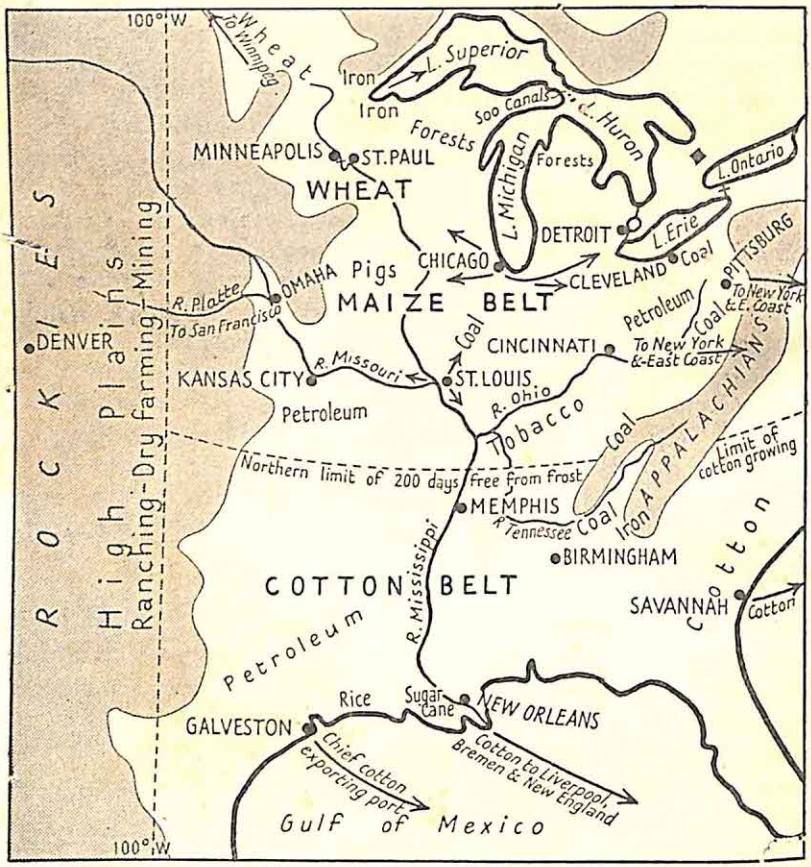
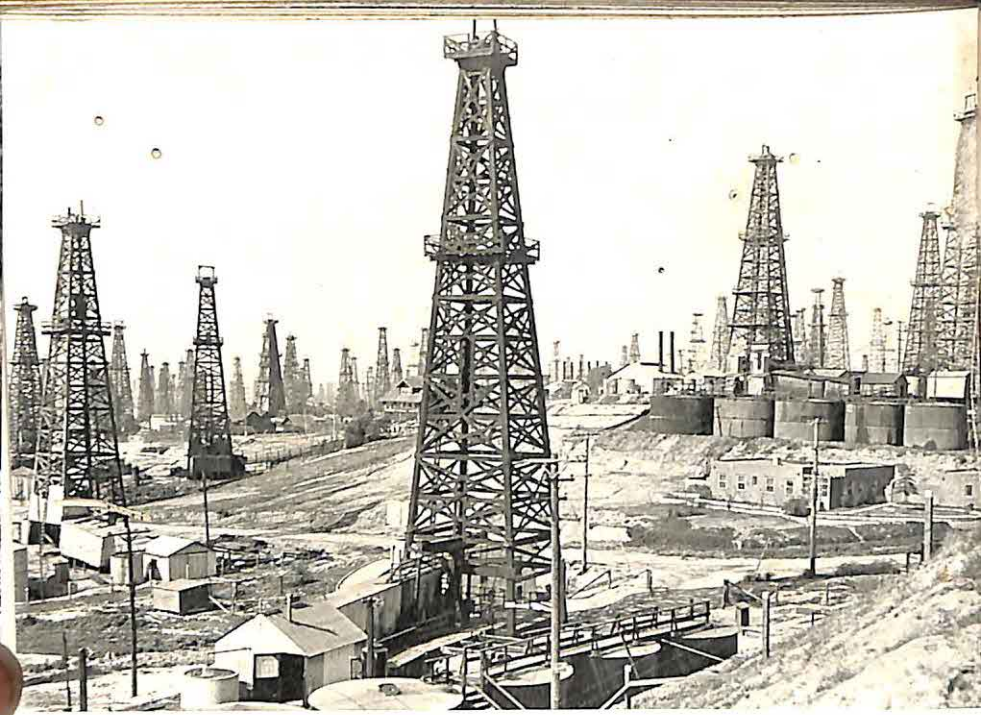


FIG. 246. United States: The Mississippi Basin.

On the south the spring wheat merges into the *maize belt.* The winters are less severe than farther north, the springs milder, and the summers hotter and longer, with more rain. Horses, cattle, pigs, and poultry are reared, but of all the crops maize is the chief. In autumn the fields are ploughed, and at the beginning of May the

41. THE CATTLE COUNTRY

(*Above*) Cattle on the High Western Plains stretching along the eastern foothills of the Rockies. These animals will ultimately be sent by rail to be fattened on the lowlands of the Mississippi, whence many will find their way to the stockyards of Chicago (*below*) (see pp. 422 and 425).



42. PETROLEUM AND COTTON

(*Above*) An oil-field near Los Angeles showing the derricks and storage tanks whence the oil is piped to the coast for export in *tankers* (see pp. 422, and 428). (*Below*) Negro cotton-pickers at work in Georgia. At the factory the cotton lint passes through a ginning machine, which separates the seeds from the fibres. After the seeds have been removed, the lint is packed into bales, each weighing 500 lb. The seeds are crushed for oil.

'corn', as the maize is called in America, is sown. In the middle of August, such portion of the crop as is needed for cattle fodder is cut, and that not immediately required is chopped up and pressed in silos for winter food. The remainder stands until the autumn, when it is harvested, and the kernels husked and dried. Some maize is used for making cornflour, starch, beer, and vegetable oils for soap. Some is fed to poultry, but the bulk is used to fatten cattle and pigs which are sent to the canneries of Chicago, Omaha, Kansas City, St. Louis, and Cincinnati.

FIG. 247. United States: Oil-fields.

In the cooler, moister districts round the Great Lakes much former forest land has been replaced by pasture, devoted mainly to dairying: milk, butter, and cheese all finding a ready market in the densely peopled urban areas.

In the region south of the maize belt proper, *winter wheat*, as well as maize, is grown. It has a higher yield than spring wheat. Sown in autumn, it reaches a height of a few inches before winter. In spring growth is rapid, the wheat ripening towards the end of June.

There are a number of *coal-fields* in the Central Lowlands yielding a rather low-grade coal. Chief among them are: the *North Michigan* coal-field, whose port *Detroit* is noted for its motor-car factories; the *Eastern Interior* field, extending through Illinois, Indiana, and Kentucky; and the *Western Interior* field, stretching from Iowa south to Texas. To these must be added the *Alabama* field, on the southern edge of the Appalachians, where the presence of coal, iron, and limestone has given rise to the iron and steel industries of Birmingham.

About two-thirds of the world's *petroleum* comes from the United States, much being obtained from the Interior Lowlands, where the chief fields, in order of importance, are those of Texas, Oklahoma,

Louisiana, and Kansas. Outside these, the principal field is that of *California*, whose output ranks next to that of Texas. From the fields oil is pumped, often for hundreds of miles, through pipe-lines to refineries, usually situated at ports.

Chicago (3,000,000), standing where east to west routes across the lowlands pass round the southern end of Lake Michigan, is a focus of railway routes. The chief port and leading market for the grain belts, it is a flour-milling and meat-canning centre. In relatively close proximity to coal, and conveniently situated for obtaining iron ore

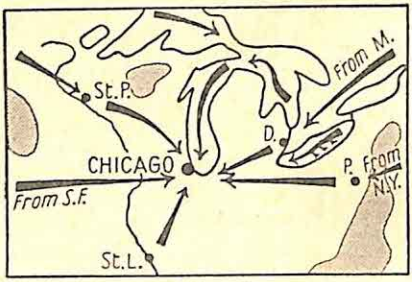


FIG. 248. Site of Chicago.

by water (from the Mesabi Range, &c.), it is a great iron and steel centre; while its nearness to a forested area has led to the establishment of saw-, pulp-, and paper-mills. *Cincinnati*, on the Ohio, another meat-packing centre, makes agricultural machinery, pottery from local clay, and maize-oil. *St. Louis* (820,000) stands at the confluence of the Mississippi, Missouri, and Illinois. Placed in a farming area, midway between the industrial districts to the east and the ranching lands to the west, and within easy reach of the cotton belt, it is a great cattle and cotton market, a flour-milling, tobacco, and boot and shoe manufacturing centre.

Their rich agricultural and mineral resources and gentle relief, which facilitates transport, have combined to give the Central Lowlands a varied economic life, and have played no small part in stimulating that independent spirit so typical of the people of this region, aptly termed 'The Middle West'.

(3) **The South-Eastern Lowlands.** South of the Ohio valley, the Central Plains merge into the South-East Lowlands, which extend to the Gulf of Mexico. They comprise (*a*) the *Lower Mississippi*

valley, which passes into (*b*) the *Gulf Lowlands* and the *Peninsula of Florida*, and (*c*) the southern portion of the *Atlantic Coast Plain*. Apart from the Appalachians, which project into the lowlands, the relief is flat or gently undulating.

(*a*) *The Lower Mississippi Valley*. Suitable conditions of soil, and *warm sunny summers with ample rain*, together with *200 frost-free days*,

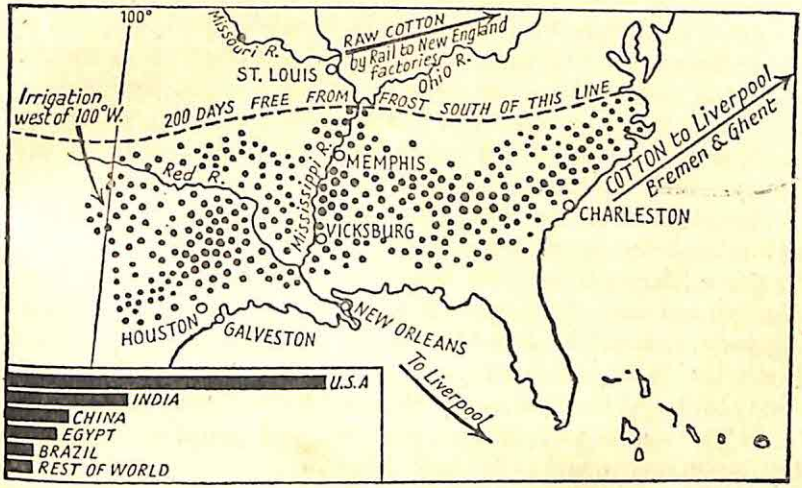


FIG. 249. United States: The Cotton Belt.
Inset: Principal Producers.

have made the lower Mississippi valley and its margins so well adapted to *cotton* growing that this region produces no less than half the world's supply. North of Cairo, at the confluence of the Mississippi and the Ohio, the warm season is not long enough for successful cotton cultivation; west of longitude 100° W. the annual rainfall is less than 23 inches, the minimum for cotton-growing without irrigation. To the south, the lowlands bordering the Gulf are unsuitable for cotton, mainly because rains fall in autumn when the crop is being harvested. The soils of the cotton belt vary from sandy and sandy or clayey loams to rich dark clays. There are certain districts which, owing to specially favourable conditions of soil and relief, are most productive. The chief of these are the flood-plain of the Mississippi, the 'black waxy' prairies of Texas, and the prairies stretching from the Mississippi valley into Alabama, and thence

along the inner margin of the Atlantic coast plain to Virginia. Considerable damage is often done to the cotton crop by the boll-weevil, the larva of a beetle which attacks the boll of the plant.

In districts where sandy soils predominate, pine-woods replace cotton-fields. In others, where land is not required or is unsuitable for cotton, maize is grown as a food crop both for the negro workers and their pigs, which provide them with pork, their staple meat dish.

Cotton is sown in February or early March in the south, and as late as the end of April in the north. Picking commences at the end of August and lasts into the autumn, for the bolls, or pods, do not all ripen at the same time. For this reason little picking is done by machinery. As it is carried out almost entirely by hand there is a demand for cheap labour, supplied by negro men and women.

Though some of the crop is shipped by river, the greater part is now transported by rail to the inland markets and ports. Among the former is Memphis, standing on a bluff overlooking the Mississippi. *Houston* and *Galveston*, both in Texas, are the leading cotton exporting ports, followed by New Orleans and Savannah (Ga.). Galveston is also the leading oil-refining and exporting port on the Gulf coast. *New Orleans*, at the head of the Mississippi delta, also exports grain, while its imports include bananas, sisal, and petroleum from the Caribbean region, and coffee from Brazil.

(*b*) and (*c*) *The Gulf and Atlantic South Coast Lowlands and Florida.* In recent decades cotton manufacturing has greatly increased in the South Atlantic States, notably at the Fall Line towns of *Montgomery*, *Columbia*, and *Augusta*, whose products are coarser and heavier than those of New England. Cheap hydro-electric power has stimulated other manufactures at the Fall Line towns, though a number of factories still use coal. Timber from the Appalachians and coastlands is made into furniture at *Macon*. *Columbus* manufactures agricultural machinery, using iron and steel from the Birmingham district. *Raleigh*, like Richmond, is noted for its tobacco factories, for Virginia and the Carolinas, like the trans-Appalachian state of Kentucky, are famous tobacco-growing areas.

Along the Gulf coast stretches of marshy land are planted with rice, and on slightly higher and better drained ground somewhat farther inland are fields of sugar-cane.

The forests of Florida yield valuable yellow pine, and palms, and fruits like bananas, oranges, and grape-fruits, testify to the warm

climate, as do numerous winter bathing resorts, such as Palm Beach and Miami. All along the South Atlantic seaboard, from Florida to Virginia, are truck farms (market gardens) growing vegetables and soft fruits for the markets of the north-eastern States.

FIG. 250. United States: Florida and the Atlantic Coast Plain.

(4) The High Western Plains. Towards the west the Mississippi Lowlands rise to the High Plains, which near the Rockies attain an elevation of from 5,000 to 6,000 feet, and whose average width is 500 miles. The region stretching from Northern Texas into Canada is called the 'dust-bowl' (p. 24). Owing to the low rainfall, the vegetation consists mainly of tufts of grass and sage-bush. The pasture is too poor to support more than a few animals per acre. Store cattle are grazed in the east: sheep in the even drier west. In autumn the cattle are sent by rail to the meat-packing plants at Kansas City and Omaha, or farther east to be fattened in the maize belt.

In this arid region, cereals and forage crops, like alfalfa, are grown by *dry-farming* methods, which aim at conserving the moisture in the soil. The ground is ploughed in early summer and left fallow until the following spring. It is frequently harrowed to keep the top soil loose. This serves a dual purpose. It prevents that hard crust forming after rain, which causes water to be drawn to the surface by capillary action; and it prevents grasses springing up and so using moisture. Crops are sown every other year and thus have the benefit of two years' rainfall. The ground must be as well cultivated when fallow as when planted. Dry farming permits the utilization of semi-arid land, but often such land is unsuitable, and in parts of the 'dust-bowl' the soil has been carried away by the wind, with calamitous results.

(5) The Rocky Mountains and Plateaux. Between the main chain of the Rockies and the Cascade and Sierra Nevada Mountains to the west lie a number of plateaux, including the Columbia Plateau; the Great Basin of Inland Drainage around the Great Salt Lake; and the Colorado Plateau, crossed by the Colorado river, whose famous canyon, cut deep into the soft horizontal strata, is 200 miles long, from 4 to 12 miles wide, and over a mile deep.

Shut off by mountain barriers from moisture-laden winds, the whole region receives a scanty rainfall. There is some grazing, but enormous tracts are almost uninhabited. Yet the soil is potentially fertile. Dry-farming methods enable excellent wheat to be grown on the Columbia Plateau, where *Spokane*, at a focus of routes, is a flour-milling centre. Warm temperate fruits and vegetables are grown on irrigated lands round *Salt Lake City* and in the Imperial Valley, the surplus being dispatched in refrigerating cars to the eastern States. When the schemes in connexion with the recently completed Boulder Dam, on the Colorado River, are completed, they will enable an area half the size of Wales to be irrigated; and the fall of water at the dam will enable four times as much power to be generated as is produced by the United States' hydro-electric plants at Niagara.

But the chief wealth of this region lies in its *minerals*. The United States is the leading country for the production of copper, lead, and zinc; ranks second to Mexico in the output of silver; and with Canada accounts for about one-quarter of the world's gold. The bulk of the United States' share of these minerals comes from mines in the western mountain states. Arizona, Utah, and Montana lead in

copper production, followed by Michigan (Keweenaw Peninsula). Utah and Montana yield most silver; and Colorado comes next to California in her output of gold. The principal smelting-centre, to which ores are sent from all parts of the western states, is *Denver*, which has grown from a small gold-mining town to a city of 300,000 inhabitants.

(6) **The Pacific Lands.** Between the Coast Range, on the west, and the Cascade and Sierra Nevada Mountains, on the east, are two valleys separated by a belt of high ground. The more northerly is the Great Pacific Valley or the Puget Trough: the more southerly is the Central Valley of California. The climate of the Great Pacific Valley resembles the adjacent portion of British Columbia, but the Central Valley of California, both in climate and products, resembles the Mediterranean Lands.

The submerged northern portion of the **Great Pacific Valley** forms Puget Sound, and the southern portion is drained by the Willamette, a left-bank tributary of the Columbia. The climate favours dairying and the growth of cool temperate fruits and cereals. The lower slopes of the mountains are clad with forests of Douglas fir and red cedar, whose timbers are floated down the Columbia and other streams to the saw-mills. Many salmon are caught in Puget Sound and the Columbia River. *Seattle*, on Puget Sound, does much trade with Alaska; and like *Tacoma*, a little farther up the Sound, and *Portland* (Oregon), on the Columbia River, carries on considerable commerce with the Far East, exporting raw cotton and copper, and importing tea, rice, and raw silk.

California. The Great Valley of California is drained by the Sacramento from the north and the San Joaquin from the south, which unite shortly before entering San Francisco Bay. The 'Gold Rush' first attracted people to California, but after the boom was over the settlers turned their attention to agriculture. Since the coming of the railways, the introduction of refrigerating cars, and the extension of irrigation, California has become the chief fruit and large-scale vegetable-growing area in the United States. Climatic conditions are ideal for ripening fruit. Oranges, lemons, and grapefruits are widely grown round Los Angeles, and, together with apricots, peaches, and vines, in the San Joaquin and Sacramento valleys. Some of the finest fruit is sent, in refrigerating cars, to the

Eastern States, but the bulk is dried. On higher slopes apples, pears, and plums are grown, while around San Francisco Bay thousands of acres are devoted to truck farming.

Ample supplies of water-power and petroleum more than compensate for lack of coal. From the main petroleum field, in the south-west, oil is pumped to Los Angeles, San Francisco, and Monterey. Sacramento is the capital of California, but far more important is *San Francisco* (634,000), on a magnificent harbour. In addition to many sea routes converging on the port, railways and airways connect it with Portland, Los Angeles, and New York—4¼ days' journey by rail, but only 18¾ hours by air. *Los Angeles* (1,280,000), the largest town in California, is best known as the chief centre of the cinematograph industry. The variety of scenery within easy distance of the city, together with the wonderful climate, helped to establish the industry here. *San Pedro* is the actual port of Los Angeles.

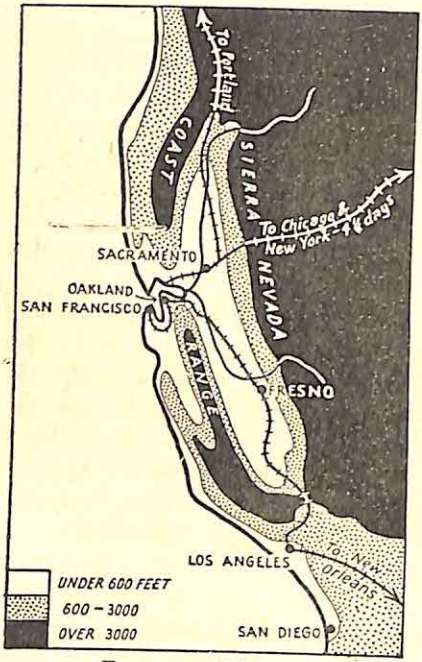


FIG. 251. California.

Communications. In pioneer days rivers were of great importance in the development of the United States, for overland transport was very expensive. To-day steamers on the Great Lakes carry vast quantities of grain, iron ore, and coal, but with this exception the river-borne trade is negligible. Even though the Erie Canal was deepened in 1918 (when it was renamed the Erie Barge Canal) traffic on it is still small. Most of the earlier railways were built to supplement the water-ways, but their development marked the decline of river traffic. To-day railways are suffering to some extent from the competition of motor traffic, but for long-distance journeys they hold their own. There are over 256,000 miles of railroad in the

United States. This mileage is equal to that of Europe, is five times that of Canada, and comprises somewhat more than 40 per cent. of the world's total. The freight carried, which consists mainly of coal, timber, ores, grain, and cotton, exceeds in bulk that of all other countries combined. Traffic is heaviest in the north-east, the chief industrial and most densely peopled area.

In spite of its enormous mileage, the United States Railway System

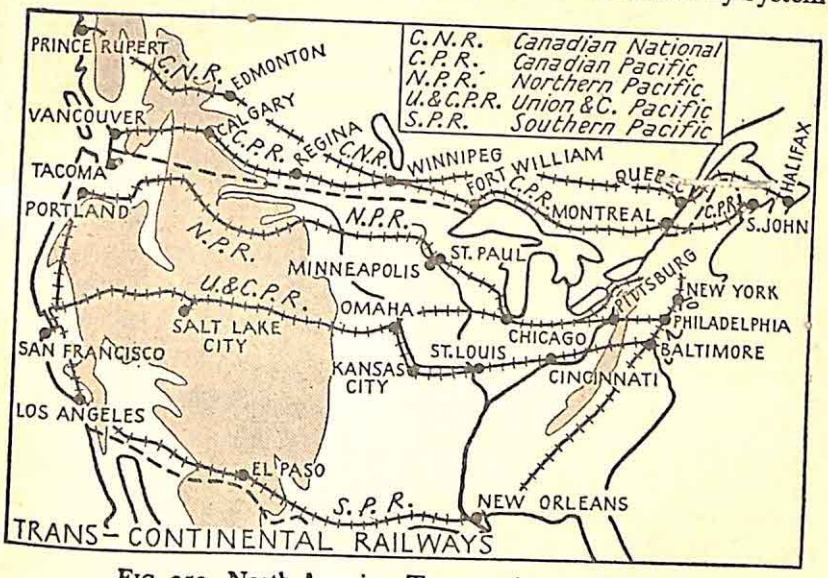


FIG. 252. North America: Transcontinental Railways.

is, in essentials, fairly simple. Though there are many lines whose general direction is from north to south, yet of greater importance are the west to east transcontinental routes which carry the products of the Pacific States, and of the Central Plains, to the thickly peopled north-east region and the Atlantic ports. These trunk lines are based on the ports, and on certain great inland centres. The chief ports are Boston, New York, Philadelphia, and Baltimore on the Atlantic; New Orleans on the Mississippi; and Seattle and San Francisco on the Pacific seaboard. The great inland railway centres are Chicago; St. Louis and St. Paul on the Mississippi; and Kansas City. From these and other junctions the main transcontinental lines connect with others to all parts of the Interior Lowlands.

In the Mississippi Plains railway construction was relatively easy: in the Appalachians and Rockies it was difficult, and railways, wherever possible, took advantage of the river valleys. In few other countries is the influence of configuration on railway construction so clearly seen as in the United States. Some of the principal lines are shown on the map (Fig. 252). Study them carefully with the aid of your atlas.

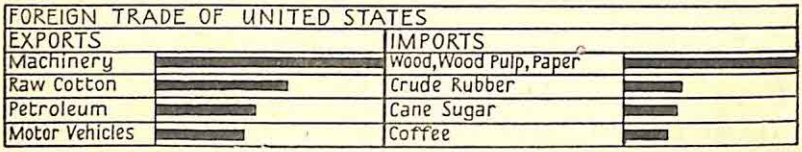


FIG. 253.

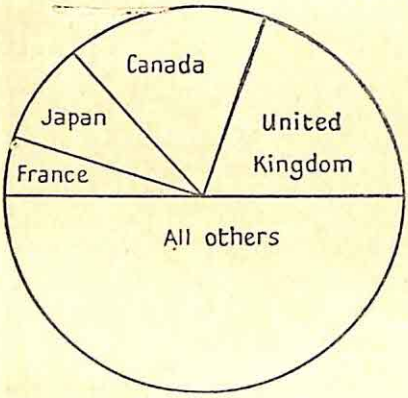


FIG. 254. United States: Exports.

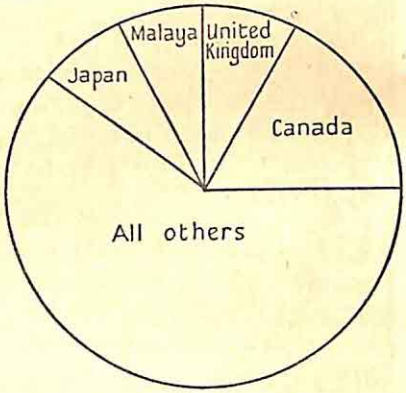


FIG. 255. United States: Imports.

The amount of *air transport* in the United States is greater than that of the rest of the world combined. Most of the principal cities are linked by air, and there are services to Mexico, the West Indies, and South America. Since October 1936 a trans-Pacific service has been established between San Francisco and Manila, the capital of the Philippines, with an extension to Macao (China). The 'clippers' travel via Honolulu, a 'hop' of 2,400 miles, and thence to Midway Island (1,300 miles), Wake Island (another 1,182 miles), Guam (1,500 miles), whence a final stretch brings them to Manila. In June 1939 the North Atlantic Air Service to Britain commenced.

Trade and Commerce. The United States is both a primary and a secondary producing country, but the bulk of her primary

products, like grain, timber, meat, coal, and iron, is consumed within the Republic, and only raw cotton, petroleum, and tobacco figure largely in her export trade. Her chief manufactured exports are machinery, iron and steel goods, and motor-cars. The leading imports are wood, wood-pulp, and paper, for all of which the demand is so enormous that, in spite of the still extensive forests in the States, large quantities are obtained from Canada. A large proportion of the tropical imports, including sugar-cane, sisal, and bananas, come from the Caribbean region. But most of the rubber is obtained from British Malaya and the Dutch East Indies.

Great Britain is the best customer of the United States, taking 20 per cent. of her exports, including raw cotton, petroleum, tobacco, machinery, and tinned foodstuffs. The value of these commodities is three times as great as those purchased by the United States from Britain, of which the chief are cotton, linen, and woollen goods. There is much reciprocal trade between the United States and Canada. Japan imports raw cotton, and in return sends to the United States camphor and, in common with some other Monsoon countries, silk and tea.

Outlying Territories. In the Pacific the chief possessions of the United States include the Hawaiian Islands, some of the Samoan Islands, and isolated islands like Midway, Wake, and Guam used as naval, cable, and radio stations, and airports on the trans-Pacific route. The Philippines, obtained by conquest from Spain, are to become independent in 1945. In the West Indies, Puerto Rico and the Virgin Islands belong to the United States.

Alaska has an area of somewhat more than half a million square miles. Salmon fishing and lumbering are carried on along its fiorded coast, but the climate of the north is too extreme for trees, and on the tundra Eskimos keep herds of domesticated reindeer, introduced from Russia. There is placer gold-mining on the Yukon River.

EXERCISES

1. (*a*) Show on a sketch-map the position of the chief cotton-growing area in the United States, and on your map mark three ports of export. (*b*) Write an account of cotton-growing in the United States under the headings: climate, soils, seasons of sowing and harvesting, labour, transport to home manufacturing areas and to British Isles. (*c*) In respect of *one* of the chief cotton-manufacturing areas in the United States state the chief factors that have led to the location of the industry in that area.

2. Illustrating your answer by a sketch-map, state *three* ways in which New York fulfils the conditions necessary for a large commercial port.

3. (*a*) Name the chief crop grown in the Agricultural Belt of which St. Louis is the centre, and show why this area is specially well adapted for the large-scale production of the crop in question. (*b*) Describe the nature of

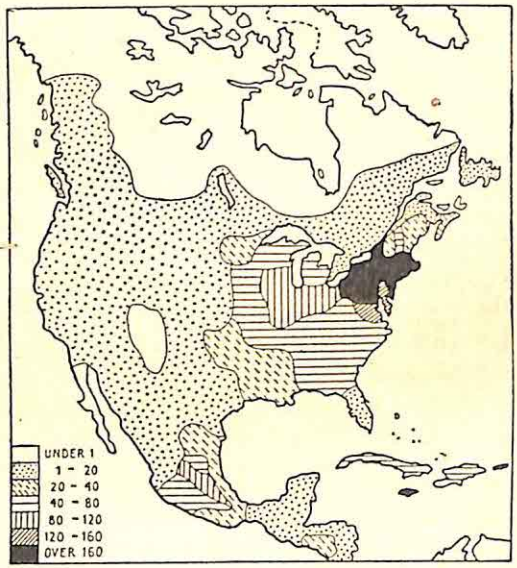


FIG. 256. North America: Distribution of Population.

the outward and inward traffic between St. Louis and (i) the region to the west, and (ii) the Pittsburg industrial area.

4. (*a*) Using your atlas, show by means of a sketch-map the route followed by *one* transcontinental railway from New York to the Pacific coast. (*b*) Show how the direction of the route you select has been influenced by configuration. (*c*) Describe the chief occupations of the different regions through which the railway passes.

5. Give an account of the industries of the following towns, with special reference to the sources of raw material: Philadelphia, Cleveland, Cincinnati, and Seattle.

6. Select *three* of the following industries: film production, furniture making, meat packing, oil refining, and tobacco manufacturing. Name *one* centre in the United States important for each of the industries selected, and explain why it has developed there.

7. Write notes on dry farming, the Fall Line, the Boulder Dam, and the 'Dust-bowl'.

8. Account for the distribution of the population of North America in the region lying between the St. Lawrence-Great Lakes and the Gulf of Mexico.

CHAPTER XXVIII

MEXICO AND CENTRAL AMERICA

MEXICO

THE Republic of Mexico, with an area of 767,000 square miles, is about four times the size of Spain. It has a population of 16½ millions, of whom about 30 per cent. are of pure Indian blood, some 15 per cent. are of European (mainly Spanish) descent, and the rest are of mixed Indian and Spanish stock.

Mexico consists of (*a*) a plateau lying between fold ranges, containing active volcanoes, like Popocatepetl; (*b*) narrow coastal plains; (*c*) the peninsulas of Lower California and Yucatan. The coastal plains, and the belt below 3,000 feet, form the *Tierra Caliente*. Typical products are mahogany, logwood, bananas (especially near Tampico), sugar-cane, and cotton grown on irrigated lands in the north. The Yucatan Peninsula is noted for henequen, whose fibre (sisal) is exported to the United States for making binder twine and sacks. From 3,000 to 6,000 feet, coffee, tobacco, and maize are cultivated in the *Tierra Templada*. Owing to its elevation (5,000–8,000 feet) the greater part of the Mexican Plateau lies in the *Tierra Fria*, where wheat is grown at lower levels, and forests and upland pastures occur up to 13,500 feet. On the Plateau stands *Mexico City*, the capital, linked by rail with *Vera Cruz*, on the Gulf of Mexico, with *Manzanillo* on the Pacific, and by northern lines with the United States systems.

Minerals account for somewhat over 60 per cent. of Mexico's exports. It is the chief silver-producing region in the world; ranks second for lead; fourth for zinc; and sixth for gold and petroleum. There are also extensive deposits of copper, as well as iron and some low-grade coal. The chief petroleum fields lie near the Gulf coast, the principal areas being south and west of the port of *Tampico*, and near *Tuxpan*.

CENTRAL AMERICA

Central America extends from the isthmus of Tehuantepec to that of Panama. It consists mainly of fold-mountains margined by plains on both the Caribbean and Pacific seaboards. As most of Central

America lies in the north-east trade-wind belt, the eastern slopes of the mountains receive the heaviest rain, though the low-lying peninsula of Yucatan (Mexico) is dry.

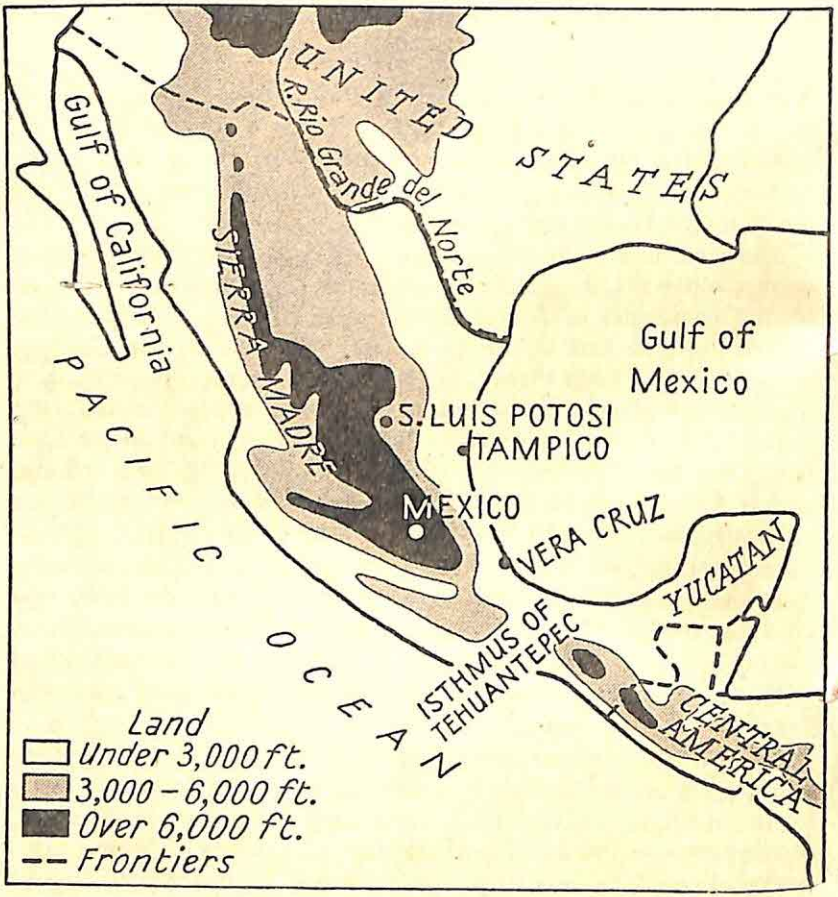


FIG. 257. Mexico and Central America.

The northern portion of Central America is politically part of Mexico. The rest of the region is divided into six independent republics: *Guatemala*, *Honduras*, *Salvador*, *Nicaragua*, *Costa Rica*, and *Panama*; and the *British* colony of *Honduras*, whose capital is *Belize*.

The people are mainly of Indian or mixed Spanish and Indian blood. Living in a region somewhat similar to Mexico, they draw the same distinction between the lowland and highland zones as do the Mexicans. The majority live in the *Tierra Templada* and *Tierra Fria* belts. Apart from maize and other foodstuffs grown for home consumption, coffee, for which Costa Rica is noted, is the only important crop.

The wetter parts of the eastern lowlands are thickly forested, but in recent years large tracts of land near the coast have been opened up for *banana* plantations, most of which belong to United States companies. At the present time Central America and the other Caribbean countries and islands produce more than half the world's bananas. The high temperatures, the heavy rainfall, and the deep alluvial soils provide ideal conditions for the cultivation of this fruit. Bananas are easy to grow, skilled labour is not needed, but where the crop is grown on a commercial scale first-rate organization is essential both in the management of the plantations and in the shipping of the fruit. The plantations are near the coast to facilitate export. As soon as the overseers are informed by wireless of the approach of the fruit ships, the bananas are dispatched to the ports, where they are ready for immediate shipment on the arrival of the vessels. The ships are equipped with every modern facility, including, of course, refrigerating chambers, both for handling and storing the perishable fruit.

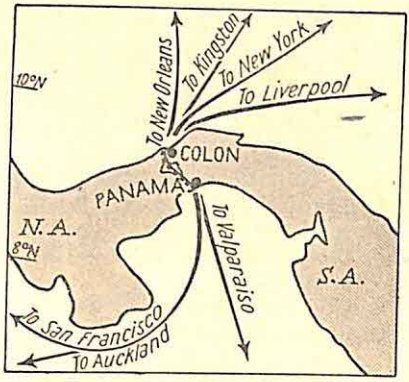


FIG. 258. The Panama Canal.

THE PANAMA CANAL

Work on the Panama Canal was commenced by the United States in 1904 and completed in 1914. The length from Colon, on the Atlantic, to Panama, on the Pacific, is 50 miles. The canal is from 300 to 1,000 feet wide, with a minimum depth of 41 feet. Three pairs of locks, near each end of the canal, raise the vessels to the level

of the Culebra Cut, across the watershed between the Atlantic and the Pacific. The passage, which takes about 10 hours, enables ships —travelling, for example, between the east and west coast ports of the United States—to save a journey of some 6,000 miles round South America. Great Britain ranks second to the United States as regards the amount of shipping passing through the canal. The benefit of the canal to the latter country, both for trade and naval purposes, is almost incalculable.

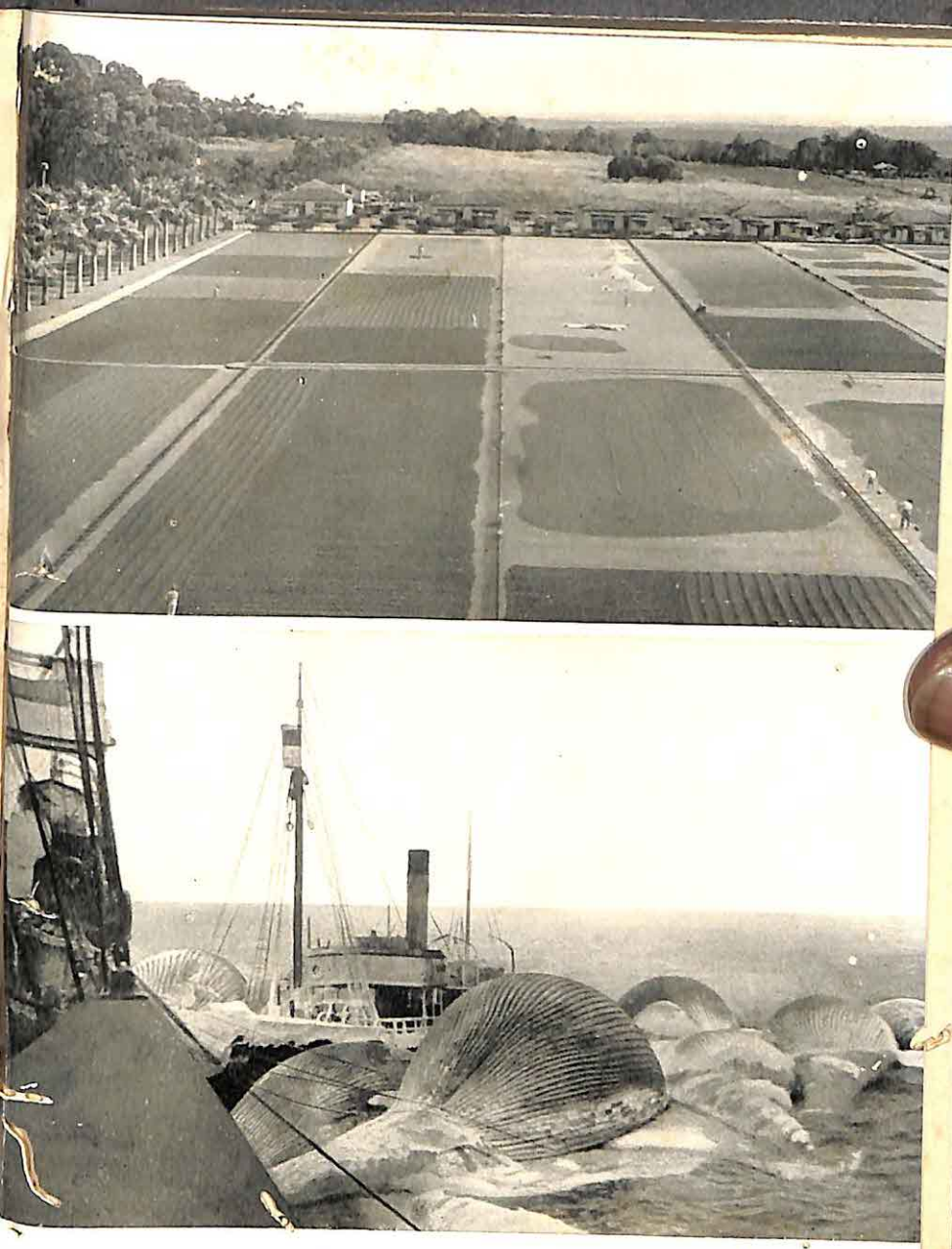
EXERCISES

1. Central America and the countries and islands in and around the Caribbean Sea produce half the world's bananas. Show how the position and the climatic conditions in the Caribbean region are specially favourable for the large-scale production of this crop.

2. In Mexico and Central America the inhabitants draw a sharp distinction between three zones whose climate and produce differ according to their elevation. Name these three zones and show how the climate and products of each are the result of its elevation.

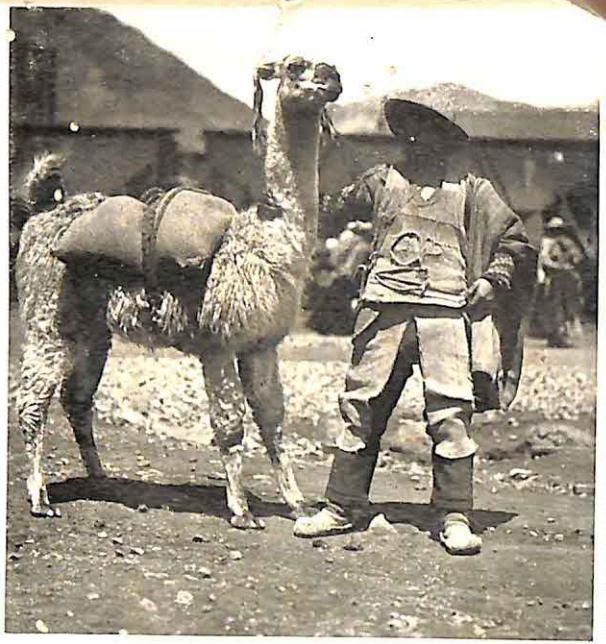
3. Discuss the importance of the Panama Canal with special reference to the United States.

4. Give an account of Mexico, noting its chief physical features, climate, crops, minerals, and people.



43. COFFEE IN BRAZIL, AND A WHALING SHIP

(*Above*) A coffee drying-ground on a fazenda, San Paulo state, Brazil. The coffee beans have been brought by cart from the plantation: now with their big brooms the men are spreading them over the concrete 'flats' to dry. (*Below*) South Georgia: the 'Mother' ship of a whaling fleet, showing inflated carcasses lashed to the stern. On the most up-to-date vessels the whale is drawn, tail foremost, through a forward hatch, worked by an electric windlass which carries it direct to the flensing floor. The whale blubber is fed to huge vats, where it is converted



44. TRANSPORT IN THE ANDES

(*Left*) A Peruvian Indian and his llama. These camel-like creatures, widely used for transport in the High Andes, can carry from 75 to 100 pounds. They cover about 12 miles a day over difficult trails, which in places narrow to a couple of feet, with a precipice often dropping to 3,000 feet or more on one side (p. 468). (*Right*) The Central Railway of Peru breaking through the Andes. In the foreground can be seen a reversing station at one of the Y-shaped switches the engineers substituted for curves. Beside the river runs the trail used for centuries by llama caravans (see p. 469).

CHAPTER XXIX

THE WEST INDIES

STRETCHING like a crescent from the Peninsula of Florida to the delta of the Orinoco, the West Indies form the north-eastern margin of the Caribbean Sea. They may be divided into: (1) *The Greater Antilles*: Cuba, Jamaica, Hispaniola, and Porto Rico; (2) *The Bahamas* and the *Lesser Antilles*, and (3) Trinidad, which is a detached portion of South America. In the Greater Antilles the mountain ranges run from east to west. The Lesser Antilles are also mountainous, and a number of islands, such as St. Vincent and Martinique, are of volcanic origin and contain active volcanoes. The Bahamas are low coral or limestone islands.

Apart from the Bahamas, the West Indies lie wholly within the Tropics, and so have a tropical climate modified by their maritime position. The annual range of temperature is small, varying from about 70° F. in winter to somewhat over 80° F. in summer. Slight rains fall in winter, but there is a heavy rainfall during the summer months, and seasonal differences depend on rainfall rather than temperature, distinction being drawn between the dry (cool) season and the wet (hot) season. Hurricanes, which occur towards the end of the rainy season, sometimes do considerable damage.

Under these climatic conditions crops can be grown throughout the year. Two West Indian crops—bananas and cane sugar—(see p. 435) are outstanding in world markets. Sugar is widely cultivated, Cuba alone ranking second in world output. The chief factors favouring *cane-sugar* production are: (1) the high temperatures; (2) the heavy annual rainfall, with some months of lesser rainfall before harvest which allows the crops to ripen under the tropical sun; (3) sea breezes; and (4) the alluvial soils. In many districts rocks of volcanic origin weather to form soils rich in such plant foods as lime and potash.

Cuba. The republic of Cuba has an area of about one and a half times that of Scotland, and a population of three millions. The people are chiefly of Spanish descent, with a large number of negroes. Sugar supplies 70 per cent. of the exports, the bulk of which are sent to the United States. Cuba is noted for its tobacco. The district

near *Havana*, the capital, produces the leaf used for making the famous cigars. Other products are coffee and sponges.

The island of *Hispaniola* is divided into the two republics of Haiti and Dominica. In *Haiti* the people are mainly negroes, and the official language is French. Coffee is the most important crop, but sugar, cacao, cotton, and sisal are also grown. The inhabitants of the *Dominican Republic* are of mixed Spanish, negro, and Indian blood.

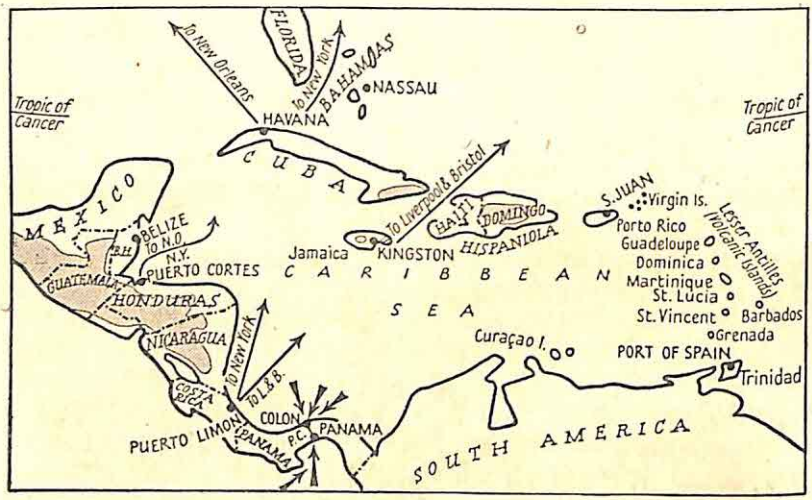


FIG. 259. The West Indies and Central America.

Sugar is the chief product, other crops being cacao, tobacco, and coffee. The language is Spanish, but many educated Dominicans speak English.

Porto Rico is ruled by the United States. The chief crops are sugar, tobacco, and coffee, all of which are exported to the States from San Juan, the capital. The neighbouring *Virgin Islands* of St. Croix, St. Thomas, and St. John also belong to the United States.

Guadaloupe and *Martinique* are *French* islands. The *Dutch* islands include St. Eustace, Saba, and St. Martin in the Lesser Antilles, and *Curaçao* off the coast of Venezuela.

The British possessions in the West Indies include Jamaica, Trinidad, the Bahamas, and a number of islands in the Lesser Antilles, among which are Barbuda, Dominica, St. Lucia, St. Vincent, Barbados, and Grenada.

The area of the *Bahamas* is about two-thirds that of Wales. The capital, *Nassau*, is a favourite resort for tourists from the United States. The chief exports are tomatoes, pineapples, sponges, and sisal.

Jamaica has a population of 800,000. The capital is *Kingston*, whence steamship lines run to Liverpool and Bristol. The chief exports are bananas, sugar, rum, coffee, and coconuts. The imports include boots and shoes, timber, and coal.

Trinidad is somewhat smaller than Jamaica, being about one-quarter the size of Wales. There are petroleum wells, and asphalt is obtained from La Brea Lake. Sugar and cacao are the chief exports; cotton goods, flour, rice, motor-cars, machinery, and boots and shoes are the leading imports. The capital is *Port of Spain*. *Tobago*, a small island to the north, is included in Trinidad for the purposes of government.

Among the exports of the *Lesser Antilles* are limes and lime juice, sugar, and sea-island cotton.

. . . . . .

The Bermudas, a group of small coral islands belonging to Britain, lying in the Atlantic 580 miles east of North Carolina, are an important naval base. They are noted for their mild climate and their scenery, which make them a favourite winter resort for Americans. There is an air service from Hamilton, the chief town, to New York (697 miles). Their chief exports are potatoes, vegetables, and cut flowers, most of which are sent to Canada.

EXERCISES

1. Write an account of the British possessions in the West Indies and Central America, paying special attention to their exports.
2. What island in the West Indies is especially noted for the production of cane sugar? Show how climatic conditions favour the large-scale production of this crop in the West Indies.

TEST PAPER: NORTH AMERICA

PART I

1. Describe the position of *two* important fishing grounds, one off the east and the other off the west coast of North America. In each case, name some of the chief fish caught, describe the methods of fishing, preparing for market, and mention *one* overseas market.

2. Draw a map of Canada to show the main regions into which it may be divided. Which of these regions is the most sparsely, and which the most densely populated? Account for the differences.

3. Draw fully labelled sketch-maps to show: (*a*) why Chicago is the most important railway junction in the world; (*b*) New York is the chief seaport in North America; and (*c*) Winnipeg is a great wheat market.

4. How do you account for the following facts: (*a*) Montreal is icebound in winter, but Halifax is open throughout the year; (*b*) Edmonton airport handles more *freight* than all other airports in North America combined; (*c*) most of the houses in Canada are built of wood; (*d*) the younger people living on the prairies are, on the average, taller than those living in the British Isles?

5. Discuss the Great Lakes as a waterway, mentioning their advantages and disadvantages for transport, and describing their trade and their general importance to Canada and the United States. Give a map.

PART 2

6. Compare the physical features of the Canadian Shield with those of the Western Cordilleras, and explain the more important differences.

7. Compare the life of an Eskimo, living in Northern Canada, with that of a *peon* whose home is on the Mexican Plateau, paying special attention to their respective environments.

8. Select *one* important farming belt in either the United States *or* Canada. Show how the relief, climate, and soils make it especially well suited to the production of its principal crop. Outline the route by which the crop is dispatched to distant markets.

9. Show how the occupations of the people of Jamaica differ from those of Newfoundland, and account for the differences.

10. (*a*) Name two airports on the eastern seaboard of North America which are terminals for trans-Atlantic routes, and one on the western seaboard which is a terminal for a trans-Pacific route. (*b*) Give an account of a journey by air from one of the Atlantic ports to the Pacific port you have named, mentioning four airports of call *en route*, and describing the nature of the country over which you fly. Illustrate your answer by a map.

PART VI
SOUTH AMERICA

CHAPTER XXX
GENERAL SURVEY OF SOUTH AMERICA
SIZE, STRUCTURE, RELIEF, AND DRAINAGE

SOUTH AMERICA, which has an area of 7,000,000 square miles, shows marked resemblances in structure and relief to North America. In both we find (1) lofty chains of fold mountains in the west; (2) two masses of much denuded eastern highlands; and (3) central lowlands.

In South America (Fig. 260) the *Andes* extend for 4,500 miles along the Pacific coast, being broadest in the centre, where they are from 400 to 500 miles wide. From the Caribbean Sea three chains, running southwards towards the equator, converge at the Knot of Pasto. Thence an eastern and a western chain enclose the Plateau of Ecuador. In the former chain is the volcano of Chimborazo (20,500 feet), and in the latter that of Cotopaxi (19,600 feet). South of the Gulf of Guayaquil three chains run through Peru to the Cerro de Pasco, near the town of that name. In Bolivia an eastern and a western chain shut in the lofty Plateau of Bolivia, an inland drainage area around Lake Titicaca. South of the Bolivian Plateau the Andes consist of one main eastern chain and lower coastal ranges which, in Central Chile, enclose the Vale of Chile. The main chain culminates in Aconcagua, an extinct volcano 22,800 feet high, the loftiest peak in the continent. South-west of this peak, the Uspallata Pass (12,800 feet) forms a route between Chile and the Argentine. In the south of Chile submergence has taken place and the coast chain is represented by islands, while the Andes themselves consist simply of one main chain. The fiorded coast of this region resembles that of British Columbia.

The Eastern Highlands are divided by the lowlands of the Amazon into (1) the Guiana Highlands, and (2) the Brazilian Highlands. Both masses are composed of old crystalline rocks which, like those of the Labrador Highlands and the Appalachians of North America, have been worn down by prolonged erosion.

There are three lowland areas drained respectively by the Orinoco

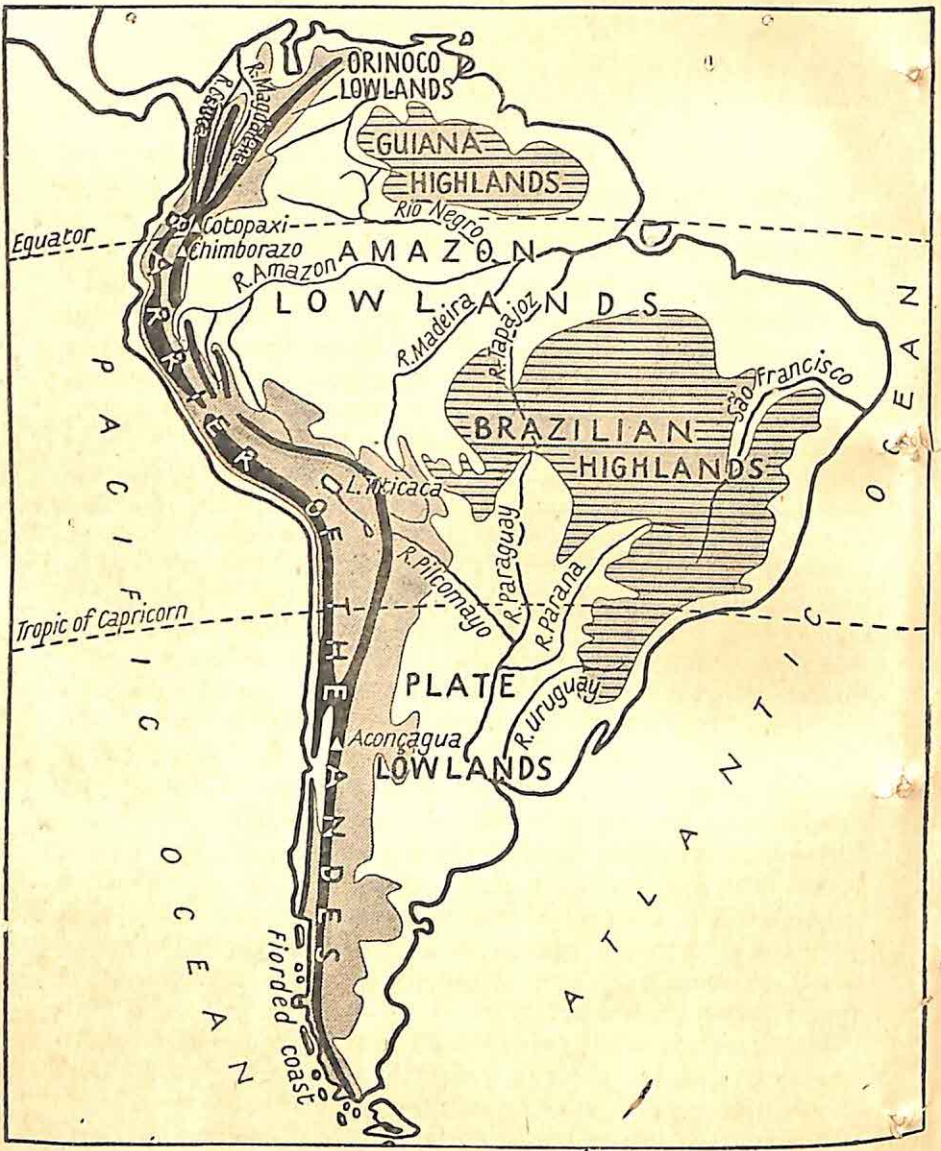


FIG. 260. South America: Physical Features.

the Amazon, and the Parana-Paraguay. Though these basins may be regarded as distinct regions, yet the divide between the Amazon and the Orinoco to the north and the Parana-Paraguay to the south is ill defined.

Rivers. Owing to the position of the Andes, all the great rivers of the continent drain into the Atlantic. The Pacific streams are short and swift, but along the coast-lands of Peru their waters are used for irrigation and to some extent for hydro-electric power. The chief rivers flowing into the Atlantic are: (*a*) the Orinoco (1,500 miles), with its tributaries the Apure and the Meta; (*b*) the Amazon (4,000 miles), whose headwaters the Marañon, Huallaga, and Ucayali rise in the heart of the Andes, and whose tributaries include the Rio Negro, Madeira, Tapajoz; and the Tocantins which flows into the estuary; (*c*) the São Francisco, flowing through the Brazilian Highlands; (*d*) the Plate, into whose estuary run the Uruguay and the Parana-Paraguay.

CLIMATE

In studying the climate of South America certain outstanding factors should be noted. (1) As the greater part of the continent lies within the tropics there is a uniformly high temperature and a heavy annual rainfall over a vast area. (2) As South America steadily decreases in width south of the Tropic of Capricorn, the climate of this temperate area is greatly modified by the vast expanse of ocean that bounds it. (3) Owing to the elevation of the Andes moderate temperatures are found in this region, even in the equatorial belt. As these mountains lie close to the west coast they form, like the Rockies, a marked climatic barrier between east and west.

Temperature (Figs. 261, 262). Nearly the whole of the lowlands of tropical South America have a temperature of 70° F., or over, throughout the year. The annual range is small: at Para, for example, it is only 2·7° F. South of the Tropic of Capricorn oceanic influences tend to moderate the temperature, and there is no marked continental climate as in similar latitudes in North America. The cold Peruvian current, flowing northward along the west coast as far as the equator, has a marked cooling effect in the coastal regions. Thus Iquique, on the west coast, with a summer (January) temperature of 70° F. is no warmer than Bahia Blanca, on the east coast, some 1,200 miles farther from the equator.

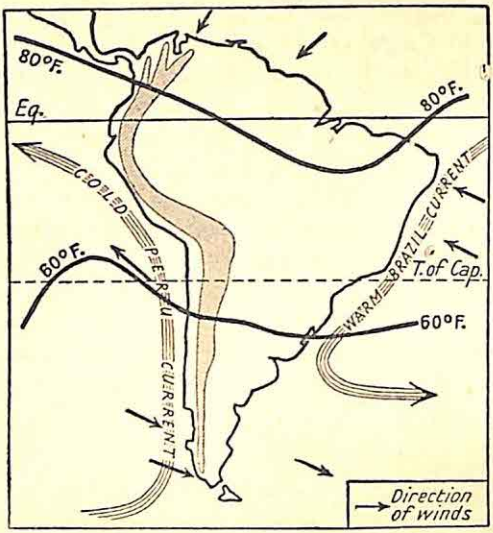


FIG. 261. South America: July Temperature.

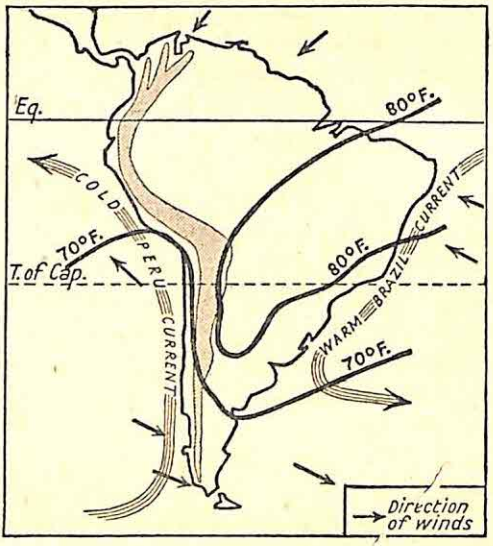


FIG. 262. South America: January Temperature.

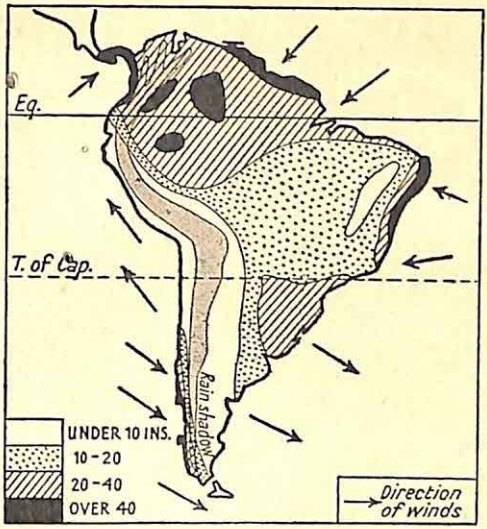


FIG. 263. South America: Rainfall, May to October.

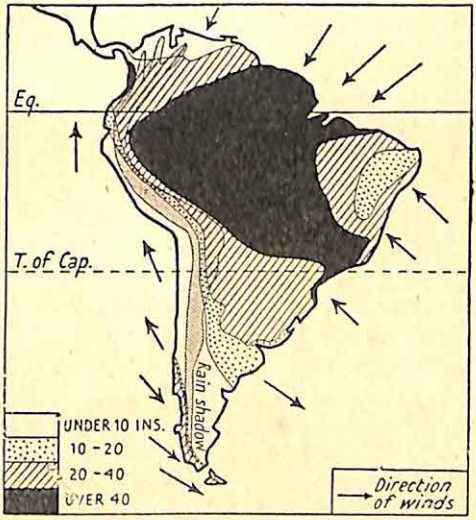


FIG. 264. South America: Rainfall, November to April.

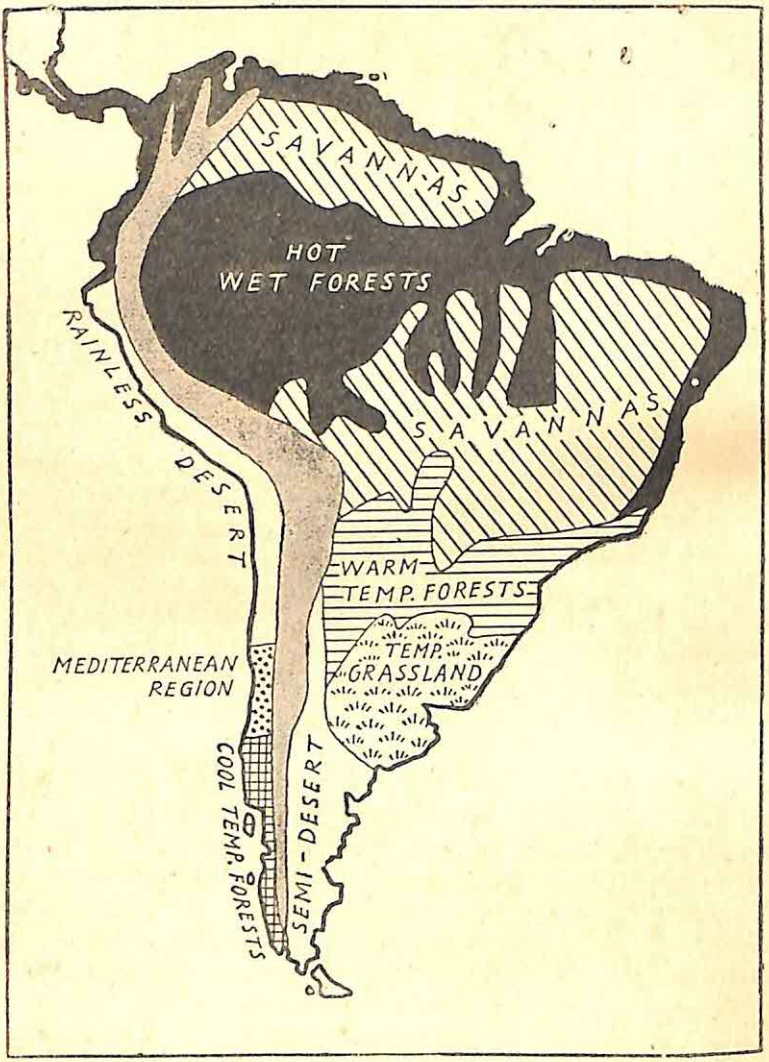


FIG. 265. South America: Natural Vegetation.

The effect of elevation on temperature is well illustrated by Quito, on a plateau in the Andes, 9,350 feet above sea-level. Though practically on the equator, it has a mean temperature of 55° F., with a range of only 0·7° F.

Rainfall (Figs. 263, 264). The north-east and south-east trade winds, blowing towards the equator, bring heavy rain to the east coast region and even to the leeward slopes of the Andes. This rainfall is increased in many areas by convectional rains, which are also responsible for the rainfall along the west coast north of the equator.

The Guianas and the basin of the Orinoco to the north of the Amazon lowlands, and the Brazilian Highlands to the south, have marked wet and dry seasons, most rain falling soon after the period when the sun is overhead. Uruguay and the southern coasts of the Plate estuary have rain throughout the year, but mostly in summer, the total amount diminishing inland.

Along the west coast, from the equator to about latitude 27° S., the winds blow off-shore or parallel to the coast, which is thus practically rainless, while in the Atacama Desert there is absolute drought. Central Chile (30° S. to 37° S.) has a Mediterranean climate; but Southern Chile, where the prevailing westerlies blow on-shore throughout the year, has rain at all seasons. Note the marked Rain Shadow, on the eastward side of the Andes, south of latitude 37° S.

NATURAL VEGETATION

In South America the relation between rainfall, configuration, and natural vegetation is well marked. *Tropical forests* cover most of the Amazon basin and the low-lying coast-lands of the Guianas, Venezuela, Colombia, and Ecuador. North and south of the Amazon forests, the Guiana and Brazilian Highlands and the greater part of the Orinoco basin are clad with *savannas*, known as *llanos* in the Orinoco region and as *campos* in Brazil. In the south-west the Brazilian Highlands descend to the lowlands of the upper Parana and Paraguay, where are found the *warm temperate forests* of the *Gran Chaco*. On the other hand, largely owing to elevation, considerable portions of the highlands of South-East Brazil, in similar latitudes, are clothed with *coniferous forests*. Farther south, the *temperate grasslands*, the *pampas*, of the Argentine and Uruguay spread from the Atlantic westward towards the foot-hills of the Andes. In the south of the Argentine, Patagonia is a region of *poor steppe* and *semi-desert*.

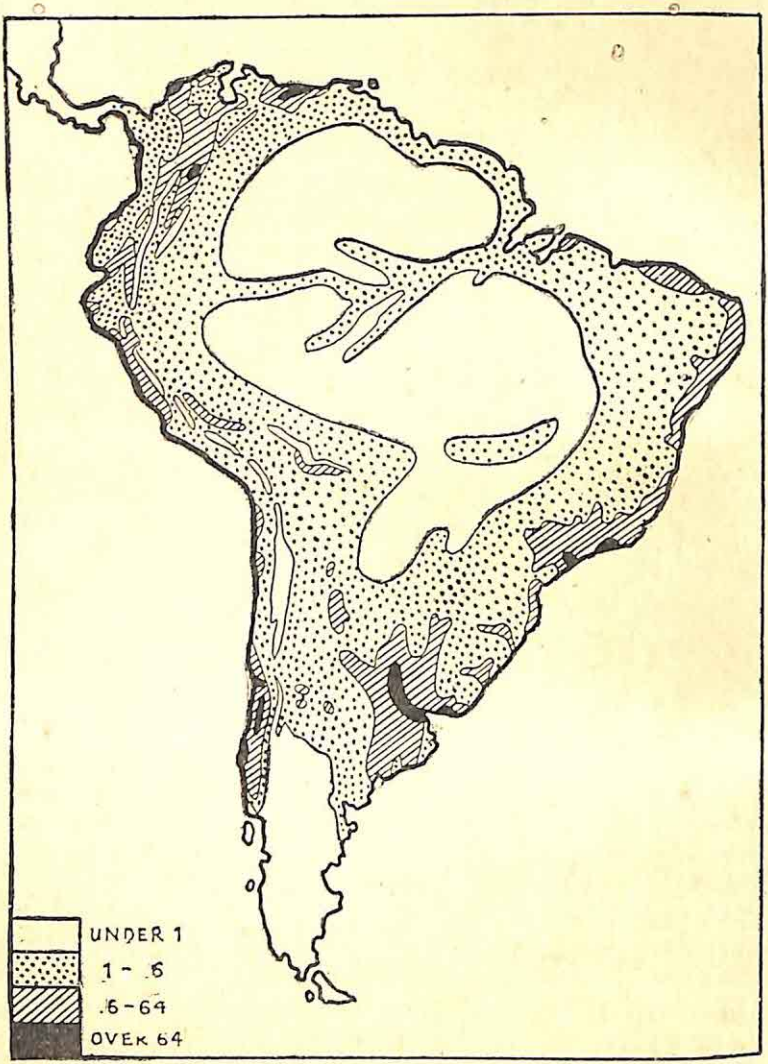


FIG. 266. South America: Distribution of Population.
(Number per square mile)

The Andes have a typical *mountain vegetation* ranging, in the equatorial belt, from tropical forests to perpetual snow. From the Gulf of Guayaquil southward, the seaward slopes of the Andes grow more and more arid until in the *Atacama Desert* there is practically no vegetation. Farther south *Mediterranean vegetation*, with evergreen drought-resisting trees and shrubs, is found in Central Chile. In Southern Chile *coniferous* and *deciduous forests* clothe the lower slopes of the rain-drenched Andes.

PEOPLES AND POPULATION

When the Spaniards and Portuguese came to South America, soon after its discovery by Columbus, they found it inhabited by Indian tribes, numbers of whom lived mainly by cultivating manioc and by hunting and fishing, as do many living in the Amazon *selvas* to-day. In contrast to these primitive folk the Incas, whose home was on the uplands of Peru, Bolivia, and Northern Chile, were highly civilized. 'Here on these lofty plateaus were temples, palaces, and fortresses, built of great blocks of stone; well-paved roads; and terraced hillsides, irrigated and planted with maize and potatoes. Poverty was unknown. Life in Cuzco, the capital, was an ever-entertaining spectacle. But the Inca Empire fell before the savage onslaught of the Spaniards. Yet, though the loss of life was terrific, the people were not wholly exterminated, and their descendants, Indians of pure stock, form to-day the majority of the inhabitants of the Peruvian and Bolivian plateaux.'[1]

The majority of the inhabitants of South America are of mixed Indian and Spanish or Portuguese blood, the Portuguese being found chiefly in Brazil, once a colony of Portugal. More recent immigrants include Italians and Germans, who are found mainly on the South-East Uplands of Brazil. In the Argentine and Uruguay, which, with Chile, are the only countries having a considerable part of their territories in temperate latitudes, the proportion of people of pure European descent is very high. Many negroes and folk of mixed negro origin are found along the south-east coast-lands of Brazil, where the climate is not unlike that of tropical Africa, whence their ancestors came.

In no other continent, except Africa, have climate, relief, and vegeta-

[1] 'America's Republics as a World Influence'; Jasper H. Stembridge. *Daily Telegraph*, 30 Nov. 1936.

tion proved so great an obstacle to settlement as in South America. The population map (Fig. 266) shows that the vast *selvas* of the Amazon are almost uninhabited, for the dense luxuriant tropical forest is quite unsuited for more than sparse settlement. The arid steppe lands of Patagonia, lying in the rain shadow of the Andes, are another thinly peopled region. On the other hand, it is the rugged topography rather than climatic conditions that hinders settlement in Southern Chile, lying on the windward side of the Andes. In the Atacama Desert settlement is confined to the nitrate and copper-mining centres and the ports through which their products are dispatched. Highland regions, like the Plateau of Bolivia, are thinly peopled, for in these elevated regions life is hard, and only with difficulty do the people wrest a livelihood from the land. Considerable areas of relatively dense population are confined to the south-east coast-lands, and to the more accessible parts of the temperate regions. Chief among the latter are the margins of the south-east Highlands of Brazil, the lowlands of the Plate estuary, and the Vale of Chile.

CHAPTER XXXI

COUNTRIES OF SOUTH AMERICA

COLOMBIA, ECUADOR, AND VENEZUELA

THE North Andean republics of Ecuador, Colombia, and Venezuela lie wholly within the tropics, but as they are traversed by the Andes they contain considerable highland areas. Each has an extensive seaboard, but whereas Ecuador faces the Pacific, and Venezuela the Atlantic, Colombia fronts both of these oceans, and so is best placed for trade with Europe and the United States, on the one hand, and the west coast of the Americas, on the other.

The natives recognize the same contrasts between the *Tierra Caliente* and the highland zones as do those of Mexico and Central America. Most of the people live in the ports, or in the more accessible parts of the *Tierra Templada* and the *Tierra Fria*. The coastal lowlands, and valleys such as those of the Magdalena and Cauca, are forested. The *llanos* of the Orinoco extend from Colombia eastward through Venezuela; while the *selvas* of the Amazon stretch from Brazil into each of the three states.

Ecuador. The most productive belt is the Pacific region, where cacao—the chief export crop—sugar-cane, bananas, and cotton are grown in the *Tierra Caliente*, and coffee in the *Tierra Templada*. The fibres of the toquilla palm are woven by Indian women into Panama hats. From the petroleum field, on the north side of the Gulf of Guayaquil, oil is piped to the coast. *Guayaquil*, the chief port and largest city, at the head of the Gulf of Guayaquil, is the outlet for a fertile valley lying between the Coast Range and the main chain of the Andes. From Guayaquil a railway, 288 miles long, winds up to *Quito*, the capital of Ecuador, situated on the plateau at a height of 9,300 feet above sea-level. The Indian peons living in this region, like their neighbours in Colombia, graze sheep and llamas on the rough pastures, and grow barley and potatoes; but their agricultural methods are primitive, their tools crude, and their crops poor.

Colombia. There are many banana plantations along the Atlantic coast of Colombia, where Puerto Colombia, the outport of *Barranquilla* (170,000), Santa Marta, and *Cartagena* (100,000) are the chief ports. Cartagena exports petroleum, which is pumped for some 300

miles from fields in the middle Magdalena valley. *Buenaventura*, the principal Pacific port, is linked by road with *Bogota*, the capital, 8,500 feet above sea-level. Cane sugar and cacao are cultivated in the *Tierra Caliente*; coffee, of which Colombia produces 12 per cent.

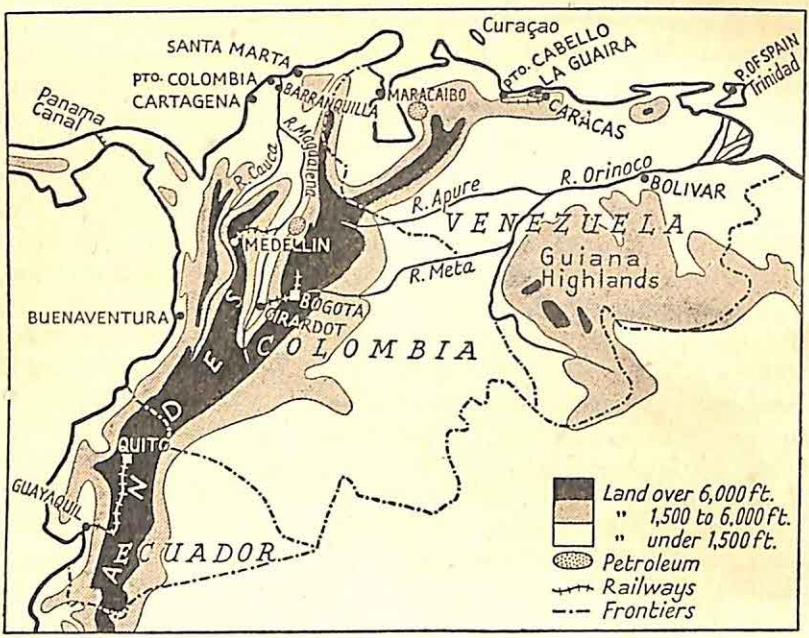


FIG. 267. Ecuador, Colombia, and Venezuela.

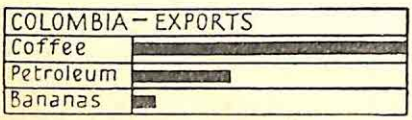


FIG. 268.

FIG. 269.

of the world's total output, in the *Tierra Templada*. The country is rich in minerals—gold, silver, copper, and manganese—but they are relatively undeveloped. Muso is noted for its emerald mines.

Steamers take 6 days to travel from Barranquilla, up the Magdalena, to Girardot, whence it is a 7-hour railway journey to Bogota; but by air the whole distance can be covered in 3 hours.

Venezuela. Cattle and sheep are bred on the *llanos* of the

Orinoco, but owing partly to poor communications and partly to floods during the rainy season (May to October) these tropical grasslands are as yet little developed. The port of Bolivar, about 270 miles from the mouth of the Orinoco, is a centre of river trade, where goods are transferred to ocean-going vessels for dispatch to Port of Spain (Trinidad) or the Venezuelan ports of La Guaira and Puerto Cabello. From La Guaira a railway and a motor road—one of the few metalled roads in the country—climb some 4,000 feet to *Caracas*, the capital. Though the two towns are only 6 miles apart, the railway is 23 miles long, so many are the spiral curves necessitated by the mountainous nature of the country. *Maracaibo*, on Lake Maracaibo, is the centre of the principal petroleum fields. The petroleum-bearing strata extend under the lake itself and many derricks actually stand in the water, above wells bored to the underlying sedimentary rocks. A bar across the lake prevents ocean tankers from reaching Maracaibo, and much petroleum is sent to the Dutch island of Curaçao to be refined and transhipped. Venezuela ranks third as a petroleum-producing country.

THE GUIANAS

The Guiana Highlands are a table-land of which the highest and most extensive portion lies in Venezuela, and not in the three European colonies—British, Dutch, and French Guiana—that bear their name. From the Highlands the Essequibo and shorter rivers flowing to the Atlantic descend by falls, of which the most famous are the Kaieteur Falls on the Potaro, a tributary of the Essequibo, while other streams flow from them to the Orinoco and the Amazon.

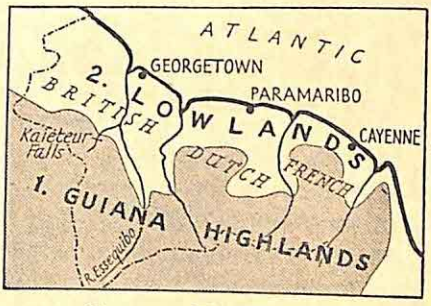


FIG. 270. The Guianas.

Rain falls throughout the year, with especially wet seasons in May and June and in December; while in the lowlands temperatures are uniformly high. British, Dutch, and French Guiana may be divided into two Natural Regions: (1) the Highlands and (2) the Lowlands stretching to the Atlantic.

(1) Some cattle are reared on the rich but undeveloped savannas of the *Highlands*, where coffee is grown at elevations of from 2,000 to 3,000 feet.

(2) The greater part of the *Lowlands* are clad with tropical forests containing such trees as mahogany; greenheart, from which a hard timber is obtained; balata, yielding rubber; and oil palms near the coast (in French Guiana). On the swampy coastal plains, which in places lie below sea-level, rice and sugar-cane are cultivated, as well as cacao in sheltered and slightly higher districts.

Placer gold is obtained from the rivers, in British Guiana diamonds are won from the streams, and bauxite is found in that colony and in Dutch Guiana.

Sugar, rum, rice, and gold are exported from all the colonies. *British Guiana* (capital *Georgetown*) also exports diamonds and bauxite; *Dutch Guiana* (capital *Paramaribo*) coffee; and *French Guiana* (capital *Cayenne*) sends coffee, cacao, and palm oil to Marseilles.

BRAZIL

Brazil, by far the largest of the South American Republics, is about ninety-two times the size of Portugal, of which she was once a colony, and is even larger than the United States. Of her 48 million inhabitants many are of Portuguese, Spanish, Italian, and other European descent, but the majority are of pure or mixed Indian blood, while others—especially along the east coast—are negroes or of negro origin. With the exception of the south-east, the whole of Brazil lies within the tropics. More than half consists of the dense *selvas* of the Amazon basin, the remainder comprising the Brazilian Highlands and the Atlantic coast-lands.

The *Amazon*, the longest river in the world, has a larger volume than any other stream, for the greater part of its basin lies within the tropical wet belt. Notice how the Amazon itself flows relatively close to and almost parallel to the equator throughout most of its course. Its headwaters, the Marañon and Ucayali, rise in the Andes within 150 miles of the Pacific. They descend through steep gorges to the densely forested lowlands, which extend, almost at sea-level, to the Atlantic. So flat are they that in the last 2,000 miles of its course the Amazon falls somewhat less than 40 feet. Owing to the flatness of its bed and to its volume the river frequently divides into numerous channels (*igrapes*). It enters the Atlantic through a huge

delta whose many distributaries form numerous islands, of which the largest is Marajo. The Para Channel, south of Marajo, is the one mainly used by shipping.

Many tributaries descend from the Guiana and Brazilian Highlands to the main stream, forming falls where they enter the lowlands. Chief among them are the Purus (1,850 miles), the Madeira, and the Tapajoz entering on the right bank, and the Rio Negro

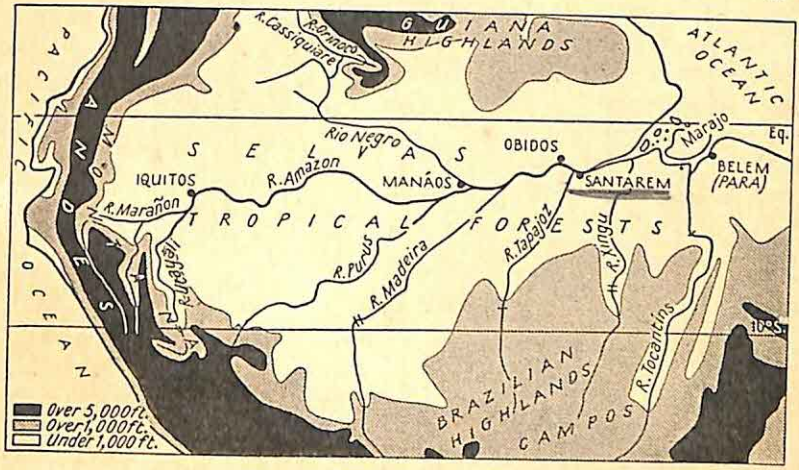


FIG. 271. The Amazon Basin.

flowing in on the left bank. The Cassiquiare, an affluent of the latter, also flows into the Orinoco, thus providing an interesting example of river capture in an intermediate state.

There are practically no roads, and few railways. Throughout the lowlands transport is carried on almost entirely by water. The Amazon is navigable to the very foot of the Andes. Small vessels can steam up-stream as far as *Iquitos* (Peru), 2,300 miles from the mouth, while larger ocean-going steamers can reach *Manaos*, 1,000 miles from the sea, which stands on the Rio Negro, a few miles above its confluence with the main stream. *Para*, the chief port of the Amazon, exports cacao, manilla, tapioca, nuts, and some rubber, though little rubber is now obtained from Brazil, its original home.

In the Amazon basin the population throughout the greater part of the region does not exceed one person to the square mile. Outside the few towns some of the scattered Indians collect wild rubber and

nuts, selling them to traders; others work on cotton, cacao, or sugar plantations; but many are uncivilized, depending for their livelihood on hunting and fishing.

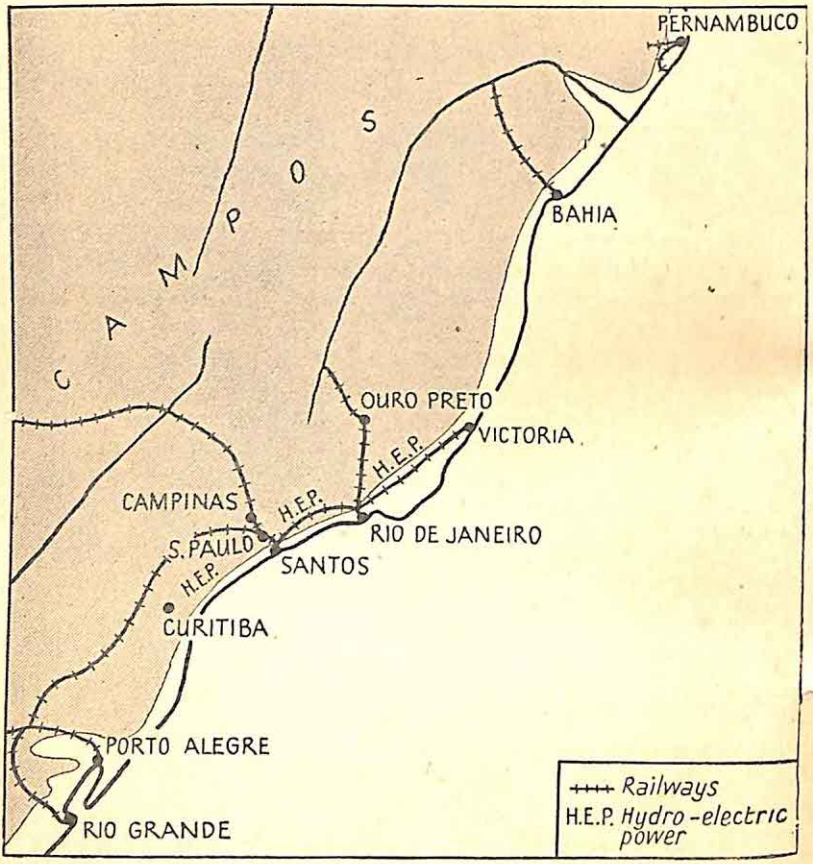


FIG. 272. South-Eastern Brazil.

Almost 90 per cent. of the people of Brazil live on the eastern margin of the highlands, or in the ports along the coastal lowlands at their base. With an average elevation of from 2,000 to 4,000 feet, the *campos* have a temperate climate, with summer rains typical of such savanna regions. Much ranching is carried on. The chief interior cattle centre is Cuyaba, on the upper Paraguay, but the most

important region is in the more accessible south-east, where cattle are sent by rail to the meat-packing establishments of *Rio Grande*, the chief port, distributing and manufacturing centre of South-East

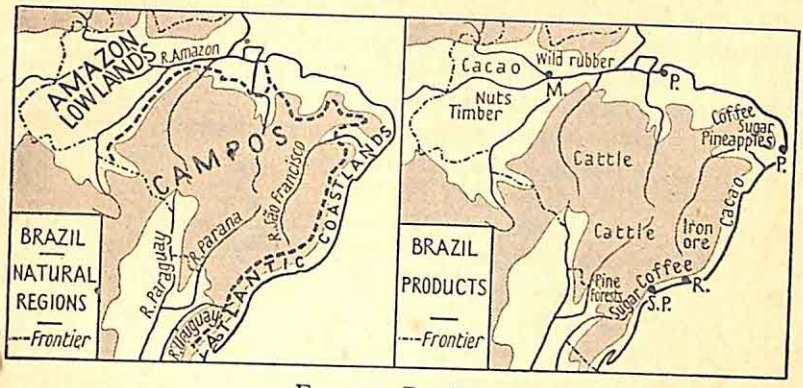


FIG. 273. Brazil.

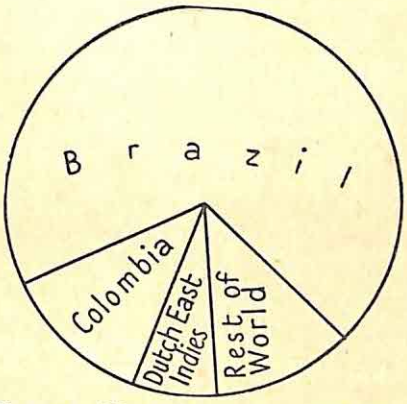


FIG. 274. World Production of Coffee.

Brazil. *Porto Alegre* is the leading commercial centre in this part of the country.

In the vast pine forests of South-East Brazil, which cover an area equal to that of France, lumbering is becoming increasingly important. Immense quantities of timber are shipped down the Uruguay river to Uruguay and the Argentine.

By far the most important crop in Brazil is *coffee*, of which the

country produces 70 per cent. of the world's output, and which accounts for from 50 to 60 per cent. of its exports. The main producing area is in the *State of São Paulo*, which alone grows more coffee than the rest of the world. Here, at elevations ranging from 2,500 to 5,000 feet, thousands of acres of well-drained hill-sides, exposed to the rain-bringing south-east trades, are planted with coffee trees. The equable climate of these tropical slopes is ideal for this crop, for the average summer temperature seldom exceeds 70° F., and the winter months are free from frosts, which are fatal to coffee

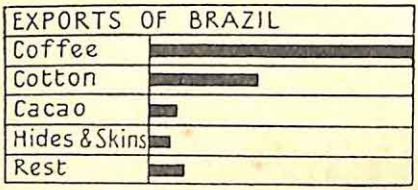


FIG. 275.

cultivation. The mean annual rainfall is about 55 inches, being heaviest in the summer months from November to February. But, above all, it is the deep red soil, formed of weathered volcanic rocks mixed with humus derived from bygone forest trees, that makes this upland region so suitable for coffee production. During the picking season, which lasts from May to September, much coffee is sent to *São Paulo* (1,150,000), the chief centre and second largest town in Brazil, whence it is dispatched by rail to the port of *Santos*. In recent years the coffee industry has suffered from over-production. To remedy this, portions of the annual crops have been destroyed and new planting forbidden by law for a period of years.

Brazil grows 15 per cent. of the world's cacao, which crop ranks second in the export list, supplying some 5 per cent. of the total. The chief plantations are found along the sheltered coastal plains stretching from Victoria northward to the mouth of the São Francisco. Much cacao is exported from *Bahia* and *Ilheos* to the United States. Oranges, of which the bulk are sent to the British Isles, are grown round Santos and Rio de Janeiro, while tobacco is cultivated in the lower São Francisco valley. There are important sugar-cane plantations in the Pernambuco district, and cotton is also grown there and in the State of São Paulo.

At one time Brazil was noted for diamonds and gold, but now the

chief mineral wealth lies in the rich, but little developed *iron* mines in Minas Geraes. Brazil lacks high-grade coal, but hydro-electric power, derived from the mountain streams of the south-east, is being increasingly used in the cotton, boot and shoe, tobacco, and match factories of a number of towns along the south-eastern seaboard. *Rio de Janeiro* (1,700,000), the capital, is the second largest town in the Southern Hemisphere. Placed on a magnificent harbour, it has good rail communications with its rich hinterland. More than two-thirds of the foreign trade of Brazil passes through Rio de Janeiro and Santos. The character of the climate is well illustrated by the exports, of which the bulk are tropical plantation products. Frozen meat and other animal produce, obtained from the ranches of the *campos*, figure in the export list, but they are not relatively so important as they are in the Argentine and Uruguay, where they hold the predominant position. Moreover, Brazil imports wheat and other cereals, while her neighbour, Argentina, exports vast quantities of grain. Imports of machinery and iron and steel goods reflect the still undeveloped state of Brazilian manufactures compared with her primary industries.

THE ARGENTINE REPUBLIC

Argentina has an area of somewhat over one million square miles and a population approaching 12 millions. Thus it is about a third the size of Brazil with approximately one-quarter of the inhabitants, but compared with the latter country a much greater proportion of the Republic is productive. In addition, most of Argentina lies within the temperate zone, and this, coupled with the fact that the majority of the people are of European descent, has tended to make the inhabitants more energetic than those of Brazil. Argentina has, however, little coal or mineral wealth. The supplies of petroleum obtained from the Chubut Oil Field (Patagonia) are relatively small, and the development of hydro-electric power in the Andean region is greatly handicapped by its distance from present and potential consuming centres. Thus, though some manufacturing has risen up under the protection of tariff walls, the Argentine is likely to remain for a long time a primary producing country.

Four main natural regions may be distinguished: (1) the Eastern Slopes of the Andes; (2) the Pampas; (3) Patagonia, and (4) the Gran Chaco.

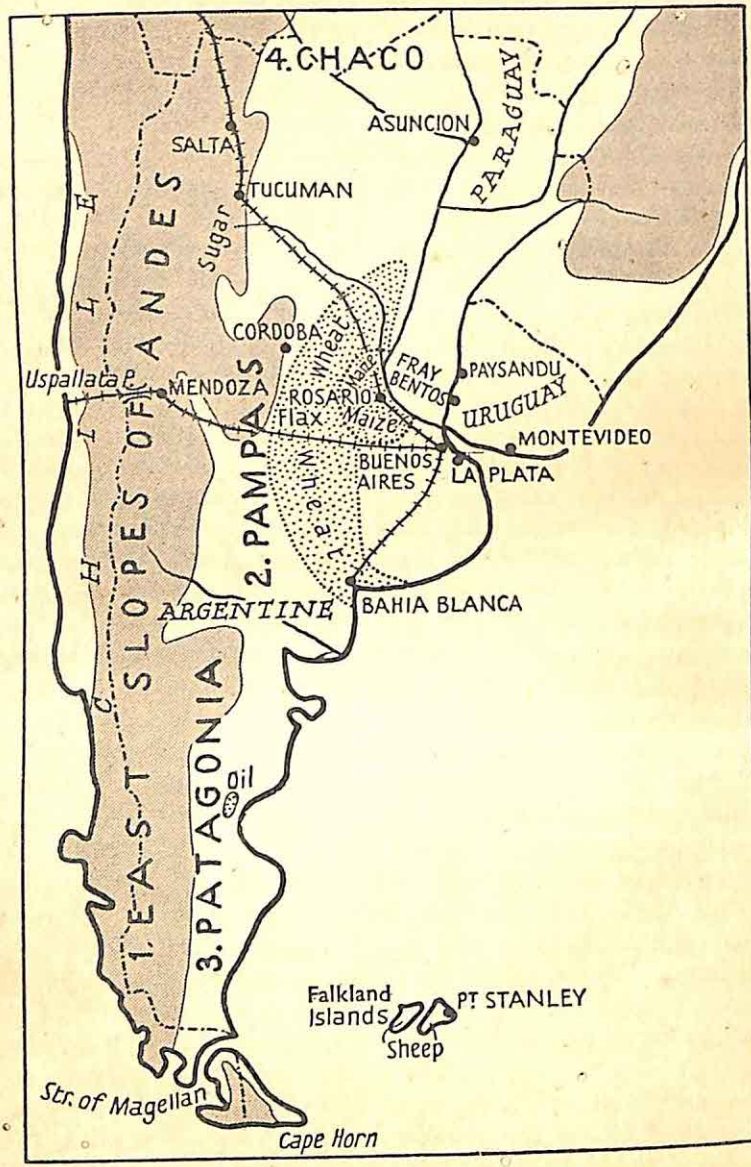


FIG. 276. The Argentine, Uruguay, and Paraguay.

(1) **The Eastern Slopes of the Andes** receive little rain. The higher slopes are arid, but in the lower valleys crops are grown on lands irrigated from snow-fed streams. Extensive irrigation schemes, carried out in the Tucuman district, have enabled a considerable area to be devoted to the growing of sugar-cane, which is refined at *Tucuman* (140,000), the provincial capital, and other centres. Another important irrigated area lies round *Mendoza*, on the Transandine Railway. The greater part of this district resembles one huge vine yard, from whose grapes is made most of the wine of the Republic.

(2) **The Pampas,** covering about one-fifth of the country, are the most productive region. Their surface, composed of alluvial and wind-borne soil, is devoid of rocks and stones; and their dead level is broken only by clumps of poplars and eucalyptus trees surrounding ranchers' homesteads, and by the towers of innumerable steel wind-pumps. There are few rivers, and it is these wind-pumps that supply the power for raising the water necessary for men, stock, crops, and railway engines. Owing to the absence of stone for road-making, the roads are merely broad tracks bounded by wire fences, which in rainy weather are a veritable sea of mud. The level surface of the pampas made the construction of railways comparatively easy, and so facilitated their development. They are used both for long- and short-distance transport. The journey by the Transandine Railway from Buenos Aires to Valparaiso takes 39 hours. The line crosses the Andes by a tunnel under the Uspallata Pass, 2 miles long and 2 miles above sea-level. Of the many railways crossing the pampas, one runs from Buenos Aires north-west to Tucuman and Salta, thence connecting with the Bolivian system.

Little more than half a century ago the pampas were a sparsely peopled region inhabited by Indian and half-breed tribes. To-day, thanks to the introduction of pedigree stock to improve the herds, barbed-wire fences, wind-pumps, modern agricultural machinery, railways, and fast steamers with cold-storage facilities, these vast grass-lands have become one of the richest farming areas in the world.

Cattle are widely grazed throughout the pampas, but the chief stock-rearing area is in the south-east of the province of Buenos Aires, where an enormous number of beef and many dairy cattle are bred. Much land is sown with alfalfa grass, whose long roots, which enable it to draw water from a considerable depth, make it more

luxuriant than ordinary grass, thus causing cattle fed on it to be brought to prime condition sooner than otherwise would be the case. Another important cattle-rearing district lies round *Cordoba* (310,000), near the foothills of the Andes. Sheep are widely grazed on the pampas and in Patagonia, but one-third of the 45 million sheep in the Republic are found in Buenos Aires province. Frozen and chilled beef and mutton, live cattle, wool, hides and tallow, butter and cheese are among the principal exports of the Argentine, but as a rule the total value of animal products is somewhat less than that of agricultural products like grain, flour, and linseed.

Wheat is the chief cereal crop, but maize, oats, barley, and flax

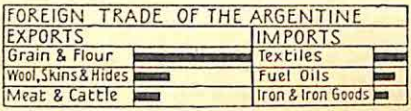


FIG. 277.

are also grown. The wheat belt forms a crescent, convex towards the west, stretching from Bahia Blanca northward for some 700 miles. The maize belt forms a smaller area within this crescent, with its centre at *Rosario* (500,000), a grain-exporting port at the head of ocean navigation on the Parana. In the southern part of the *Entre Rios*, as the district between the Parana and Uruguay is known, much flax (for linseed) is grown.

Buenos Aires (2¼ millions), the capital and chief port of the Argentine and the largest city in the Southern Hemisphere, is the focus of the country's 24,000 miles of railway, and the eastern terminus of the Transandine line to Valparaiso. Through this port passes the bulk of the Republic's overseas trade. *La Plata* (200,000), a meat-canning centre, is a grain- and meat-exporting port; and *Bahia Blanca* (110,000) exports wool and grain.

(3) **Patagonia.** Millions of sheep are bred on the Patagonian Plateau, but owing to the low rainfall and the relative poorness of the pastures the number per acre is small. The inhabitants are mainly shepherds, and in the whole of this region, comprising about one-third of the Republic, there is no large town.

(4) **The Gran Chaco** stretches from the upper Paraguay to the

Andes. The Argentine portion occupies one-fifth of the country. In these vast forests the most valuable tree is the quebracho, the 'axe-breaker', which, like teak, grows in single stands. Its bark yields tannin, used in tanning leather. In the north-east of the Chaco, and in the adjacent areas in Paraguay and Uruguay, yerba maté, or Paraguayan tea, grows both in the wild and cultivated states.

URUGUAY

Uruguay, the smallest of the South American Republics, has a population approaching 2 millions, mainly of Spanish and Italian descent. The Republic stretches from the Atlantic to the river Uruguay, which, with the Plate estuary, separates it from the Argentine. Uruguay consists almost entirely of rolling, treeless grass-lands, which form an eastern expansion of the pampas; and both in climate and natural vegetation the country resembles the province of Buenos Aires. Stock rearing is the main occupation. There are in the Republic some 7 million cattle, 20 million sheep, and over half a million horses. *Fray Bentos* and *Paysandu*, on the Uruguay river, handle meat products. Wool, frozen mutton, beef, meat extracts; fine hides from sheep, and thicker hides from cattle; together with other animal produce, furnish over 80 per cent. of Uruguay's exports. About one-fifth of the land is devoted to mixed farms on which, in addition to stock, crops like maize, wheat, oats, and flax are grown. Vines, apples, and oranges are also cultivated. *Montevideo* (675,000), the capital, stands on the northern side of the shallow Plate estuary. British and Scandinavian whaling-ships, fishing in Antarctic waters, use its harbour for winter anchorage.

PARAGUAY

West of the Parana, and bounded partly by the Paraguay river, lies the Republic of Paraguay. Its considerable forests include the eastern portion of the Gran Chaco, from which quebracho and yerba maté are obtained. Much of Paraguay consists of grass-lands which are admirably suited for cattle, of which there are some 4 million in the country, though, except in the south, temperatures are too high for sheep. The packing establishments produce beef, corned beef, 'jerky' (beef that is dried and salted), hides, tallow, and other by-products mainly for export. The climate, though rather wet for wheat, is good for maize. Other crops include cane sugar, oranges,

cotton, and tobacco; while some rice is grown, and recently banana plantations have been started. Some iron and copper are mined. One-ninth of the population live in *Asuncion* (95,000), the capital, at the confluence of the Paraguay and the Pilcomayo. The city is well placed for river trade and is a collecting centre for produce which is shipped down-stream to Buenos Aires, some 950 miles distant.

THE FALKLAND ISLANDS

The Falkland Islands, a British Colony, lie 300 miles east of the Strait of Magellan. *Port Stanley* is the capital. Sheep farming is the principal occupation, but the islands are also a centre for whaling vessels fishing in the Antarctic; and whale oil is an even more important export than wool. *South Georgia*, another British possession, lying to the south-east, is also a whaling centre.

CHILE

Lying between the Andes and the Pacific, Chile has an area of about 285,000 square miles, or somewhat more than three times that of Great Britain. Its coast-line extends for 2,800 miles, while its average width is about 100 miles. There are three Natural Regions: (1) Southern Chile, extending from Valdivia southward, where the prevailing on-shore westerlies cause heavy rain throughout the year, especially during the winter months from May to August; (2) the Central Vale of Chile, stretching from latitude 30° S. to 40° S., which in winter lies in the rainy west-wind belt, and in summer in the rainless south-east trade-wind belt; and (3) the Atacama Desert of Northern Chile, which has no rain, for the winds blow off-shore or parallel to the coast throughout the year.

(1) **In Southern Chile** the Andes, though lower than farther north, rise steeply from a sunken coast, indented with fiords and fringed with islands which represent the peaks of a submerged range. As driving gales often sweep along the coast, most of the trees in this forested region are somewhat stunted and are not so fine as those of British Columbia, a region which in its physical features, climate, and natural vegetation greatly resembles Southern Chile. Some lumbering and fishing are carried on. Sheep are bred round Puerto Montt, in the north, and Magallanes (Punta Arenas), on the Strait of Magellan, which has an export trade in mutton and wool.

(2) **The Central Vale of Chile**, lying between the Coast Range and the main chain of the Andes, is 600 miles long and some 30 miles wide. The north has a Mediterranean climate, though in the valley itself, where the influence of the sea is not strongly felt, the summers are warmer and the winters cooler than along the coast. Wheat, barley, oats, and maize are grown. Vines are cultivated (mainly for wine) as well as cool and warm temperate fruits such as apples, plums, apricots, peaches, and citrus fruits like oranges and lemons. Sheep are bred for mutton, wool, and hides; and wool is also obtained from alpacas and llamas, which are widely used for transport in mountainous districts. Beef and dairy cattle are reared for meat and other produce required for home consumption, but supplies of meat are insufficient to meet the demand and considerable quantities are imported from the Argentine. Some low-grade coal is mined to the south of the port of *Concepcion*, which was partly destroyed in the disastrous earthquake of January 1939, which laid in ruins a number of towns, and devastated a vast area, in Central and Southern Chile. *Santiago* (750,000), the capital, and *Valparaiso* (193,000), the chief port, are both situated in

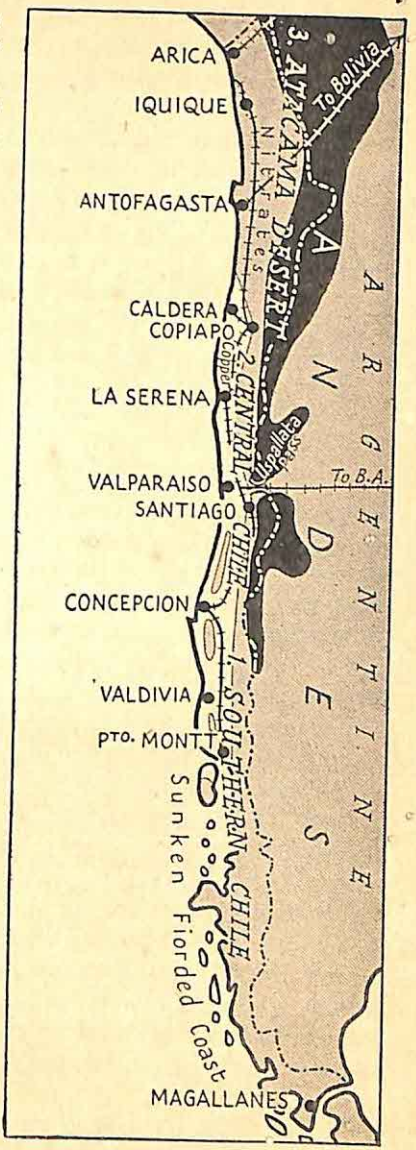


FIG. 278. Chile: Natural Regions.

Central Chile. The latter, which is the western terminus of the 800-mile Transandine Railway, stands on the only really good harbour on the west coast of South America. It refines sugar; manufactures rolling-stock for use on Chile's 5,500 miles of railway, as well as carts and furniture, with timber transported cheaply by water from Southern Chile.

(3) **Northern Chile.** Despite its arid nature, characterized as it is by an entire absence of rain and a barren harbourless coast, Northern Chile is the chief source of the country's wealth, supplying nearly 90 per cent. of the total exports. Of this amount nitrates and iodine (a by-product obtained from nitrates) provide 45 per cent., and copper 40 per cent. The *nitrate belt* extends through the Atacama Desert for 450 miles, lying at a distance of from 15 to 90 miles from the coast, and at elevations ranging from 3,500 to 10,000 feet. In this region, as there is no rain to wash the salts out of the soil, the nitrates have accumulated in the form of vast deposits, lying in layers a small distance below the surface. After the covering layers have been removed the nitrates are dug up and are taken to sheds, where they are crushed; and, after they have been dissolved in hot water to separate them from the sand and clay, the solution is evaporated and the salts crystallized out. They are then transported by rail to *Iquique*, *Antofagasta*, and *Caldera*, where the sacks are slung into big lighters that convey them to vessels anchored some miles offshore. Nitrates are shipped to the United States for use as fertilizers, and large quantities are supplied to factories in many parts of the world for making nitric acid.

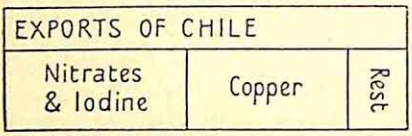


FIG. 279.

One-fifth of the world's *copper* is obtained from Chile. The chief centres are in the mountains behind Antofagasta, and near *Copiapo* (connected by rail with the port of Caldera), *La Serena*, and *Coquimbo*. *Iron ore* is also mined near the two latter towns. Owing to the absence of high-grade coal in Chile, the greater part of the ores are sent for smelting, via the Panama Canal, to the Eastern United States. *Arica*, near the Peruvian frontier, and Antofagasta both export tin, mined in Bolivia.

PERU AND BOLIVIA

Peru and Bolivia, taken as a whole, may be divided into three regions: (1) the Coast-lands between the Andes and the Pacific; (2) the Andes; and (3) the forested Montana Region sinking to the Lowlands of the Amazon Basin.

(1) **The Coast-lands.** South of the Gulf of Guayaquil lies a rainless region, where the winds blow off-shore or parallel to the land at all

FIG. 280.

seasons. The Peruvian coast lacks good natural harbours, and the marginal lands are arid and sandy except in the river valleys. But the waters of short, snow-fed streams descending from the Andes are used to irrigate many valleys, thus forming veritable 'Little Egypts' in an otherwise barren region. Cotton and sugar-cane—the only two important agricultural exports of Peru—are widely grown in such valleys. The main sugar-producing area is in the north, where Trujillo is the chief port of export.

(2) **The Andes,** with their parallel chains, longitudinal valleys, and high intermont plateaux, rise to volcanic and other peaks, whose heights exceed 20,000 feet. On the plateaux, at elevations ranging from 9,000 to 11,000 feet, maize, wheat, barley, oats, and potatoes are grown. The agricultural methods of the Indians are primitive. After rough wooden ploughs drawn by yokes of oxen have lightly

furrowed the ground, the seed is scattered broadcast. The ripened grain is cut by hand and carried to the threshing floors, where it is either trodden out by oxen, or beaten with flails.

On the higher lands, up to 13,500 feet, cattle and sheep are grazed, as, too, are those dwarf camel-like creatures llamas and alpacas; and

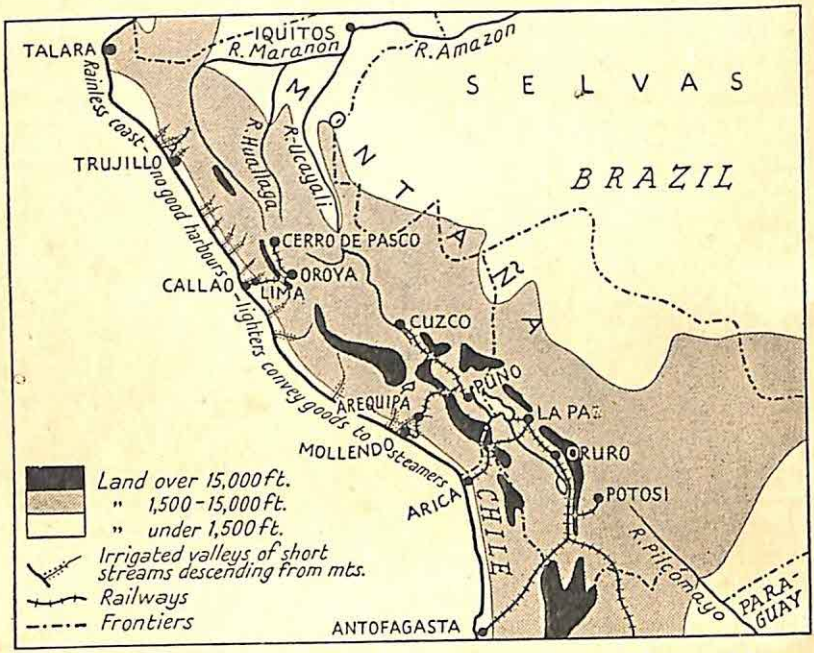


FIG. 281. Peru and Bolivia: Relief, Communications, and Irrigated Areas.

their untamed relations the guanacos and vicuñas wander over the mountain side. The sure-footed llamas are the chief transport animal of the Andes, and their coats, like those of the alpacas, yield wool, for which Arequipa is the chief collecting centre and market.

(3) **The Montana** or forest region stretches along the eastern slopes of the Andes, whence steep tropical valleys, called *yungas*, lead to the *selvas* of the Amazon. The *montana* produces coffee and coca, whose leaves are used for manufacturing cocaine. Wild rubber, nuts, and timber are obtained from the *selvas*.

The *mineral wealth* is considerable. Petroleum is the chief export

of Peru, where the most productive field lies near the port of Talara. Much copper is also mined. The chief mines are near Cerro de Pasco, whence the ore is sent by rail to Oroya, where it is smelted with local coal and turned into bars which are exported from Callao. Bolivia is rich in *tin*, silver, copper, and lead. The country provides over one-quarter of the world's tin, ranking second only to the Malay States. In Bolivia, Oruro is the centre of the chief tin-mining area, while Potosi, to the south, is the principal silver-mining centre.

The steepness of the Andes, and the great height of even the lower

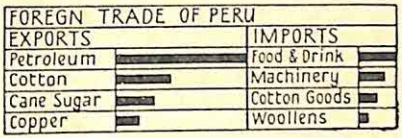


FIG. 282.

passes, make road and railway construction difficult. There are few good roads and, apart from short railways serving the irrigated valleys, there are only five lines (two with terminal ports in Northern Chile) connecting the coast-lands with the interior.

Lima, the capital of Peru, is connected by rail with *Callao*, the chief port. Beyond Lima the line zigzags up the mountains, passing through the Gelera tunnel at a height of 15,693 feet before reaching Oroya, whence it continues to Cerro de Pasco. From *Mollendo* a railway runs through *Arequipa*, situated in an irrigated valley, to *Puno* on Lake Titicaca, the centre of an inland drainage area. Shortly before reaching Puno a branch line runs north to *Cuzco*, the capital of the former Inca Empire.

As Bolivia has no seaboard the railways linking it with the Pacific run through Chilean or Peruvian territory. From Arica a line runs to *La Paz*, the chief city of Bolivia, standing south-east of Lake Titicaca, at a height of 12,000 feet. This line runs south to Oruro and thence, after sending a branch to *Potosi*, reaches Uyuni, where it divides: one branch running south-west to the Pacific coast at Antofagasta, the other going south-east to Buenos Aires, a three days' journey by rail from La Paz.

EXERCISES

1. Give a careful account of the Andes mountain system from the point of view of relief and drainage. Describe the natural vegetation on the eastern and western slopes of the mountains in their different sections and show how it is related to climatic conditions. Illustrate your answer by a sketch-map.

2. Draw a map of the west coast of South America and on it show the direction of the prevailing winds in (i) summer and (ii) winter. Distinguish, by appropriate shadings, between the areas receiving (i) rain at all seasons, (ii) little or no rain, and (iii) rain during winter only.

3. (*a*) On a sketch-map of South America mark and name the chief belts of natural vegetation. (*b*) Describe the natural vegetation of the *selvas* of the Amazon basin. Name four trees and four cultivated plants typical of this region. (*c*) Describe the position of *one* extensive tropical forest area outside South America. (*d*) How does the natural vegetation affect (i) settlement, and (ii) transport in tropical forest areas. (*e*) How do the amount and seasonal distribution of rainfall and high temperature affect the vegetation of the *campos* of Brazil? Name two trees and two crops grown on the *campos*.

4. (*a*) Describe *four* of the chief factors that have contributed towards making the state of São Paulo, Brazil, the chief coffee-producing area in the world. (*b*) Name in order of importance the three chief coffee-exporting ports of Brazil. (*c*) To what countries is the Brazilian crop chiefly exported? (*d*) Name three other coffee-producing countries.

5. (*a*) Draw a sketch-map of Argentina to show the chief natural regions into which it may be divided. (*b*) State briefly the relation of natural vegetation to climatic conditions in each of the natural vegetation regions. (*c*) State, giving your reasons, which of the regions into which you have divided Argentina makes the most important contribution to the life of the country.

6. (*a*) Name one drawback from which Bolivia suffers in the competition for world trade. (*b*) What other country in South America suffers from a similar drawback? Name the chief exports of Bolivia, and state through what seaports they are chiefly exported.

7. (*a*) Name the chief crops cultivated on the high plateaux of Peru and Bolivia. State briefly what you know of the agricultural methods practised. (*b*) Name the chief animals bred on the plateaux. What product or products obtained from them enter into world trade? (*c*) Name one animal largely used for transport purposes in the Andes, and state how it is adapted to the geographical conditions.

8. Draw a map of South America and on it shade the most densely peopled areas. Account, so far as you can, for the density of population in these areas.

9. (*a*) On a sketch-map of the west coast of South America (i) shade the high land, (ii) mark and name the chief ports from which railways lead to the interior, and mark the lines in question. (*b*) In the case of each port give some account of its trade. (*c*) In what way are the majority of these ports handicapped for handling goods? (*d*) With what country do they mostly trade, and what factors have played a great part in developing that trade?

10. (*a*) Describe a railway journey from Valparaiso to Buenos Aires, paying attention to (i) configuration, (ii) regions and occupations of the people of the area traversed by the railway. (*b*) Name one other railway which crosses South America from the Pacific to the Atlantic, and mention two terminal ports and three towns *en route*.

11. Under the headings (i) position, (ii) relief and climate, (iii) products, (iv) communications and towns, write an account of Colombia and Venezuela treated as one area.

12. Divide the Guianas into Natural Regions. For each region (i) describe the characteristic features, and (ii) mention the chief crops, and in the case of *one* of them show why the area is well suited to its production.

13. Illustrating your answers by sketch-maps, describe the position and trade of Rio de Janeiro, Montevideo, and Para.

14. (*a*) Draw a sketch-map of Chile, showing the chief Natural Regions into which it may be divided. In the case of each region name two products and two towns. (*b*) State, giving your reasons, which region is best suited for settlement. (*c*) Which of the regions is the greatest source of wealth to Chile? State the chief products of this region. To what country are they mainly sent, and why?

15. (*a*) Name *three* important industries carried on at Buenos Aires. Account for the location of any *two* of them in this city. (*b*) Name *one* other town in Argentina, *one* in Brazil, and *one* in Uruguay, each of which has for similar reasons *one* of the industries carried on at Buenos Aires. In each case name the industry.

TEST PAPER: SOUTH AMERICA

PART 1

1. Compare North and South America under the headings: (i) physical features; (ii) climate; (iii) natural vegetation.

2. Draw a sketch-map of the Panama Canal. How has its construction affected the trade of the west coast ports of South America? From what disadvantages do most of these ports suffer?

3. Draw a fully labelled sketch-map to show why the Atacama Desert is rainless. Discuss the importance of this region to Chile.

4. (*a*) Draw a sketch-map showing the chief regions into which Brazil may be divided. (*b*) Select one of these regions and describe it under the headings: (i) the relations of the physical features and climate to the natural vegetation; (ii) occupations of the inhabitants as affected by environmental conditions; and (iii) overseas trade.

5. Name the chief British possessions in Central and South America (including the West Indies). Write a geographical account of one of them and describe its trade with Britain.

PART 2

6. Compare the Argentine pampas with the Prairie Provinces of Canada with regard to (i) position in relation to world markets; (ii) climate; (iii) farming activities.

7. Why is the term *Latin America* often applied to the Americas from Mexico southward? What Latin races colonized this area? In what respects is their influence seen to-day?

8. Explain (*a*) why farms in Patagonia are usually very large; (*b*) why the bulk of South American ores are sent to other countries to be smelted; (*c*) why the hydro-electric resources of the Argentine Andes are relatively little utilized; and (*d*) why the Andean region is subject to earthquakes.

9. Name *two* important raw materials, and *three* food products that South America contributes to the needs of Great Britain. In each case mention *one* area of production and the chief port of export for that area. Selecting *one* of the food products, describe the conditions that favour its production in the area you have named.

10. What do you mean by (*a*) *river capture*, and (*b*) *inland drainage*? Illustrate your answers from South America?

PART VII

AUSTRALIA, NEW ZEALAND, AND THE PACIFIC ISLANDS

CHAPTER XXXII

AUSTRALIA

GENERAL SURVEY OF AUSTRALIA

THE Commonwealth of Australia includes, in addition to the mainland of Australia, the island of Tasmania in the south. Papua (south-eastern New Guinea) and the Territory of New Guinea (north-eastern New Guinea) are separately administered by the Commonwealth, the latter Territory being governed under a Mandate from the League of Nations. Australia is bounded on the north-west and west by the Indian Ocean, on the south by the Southern Ocean, and on the east by the Pacific. Their remote position in the Southern Hemisphere, coupled with their great distance from Europe, long retarded the development of Australia and New Zealand; while in more recent times their relative isolation has done much to stimulate in their inhabitants an independent outlook.

The mainland of Australia extends from 10° S. almost to 40° S., a distance of approximately 2,100 miles; while the Tropic of Capricorn crosses the continent in its widest part. Nearly 3,000,000 square miles in area, Australia comprises almost one-fifth of the British Empire, but despite its size a considerable proportion is unsuited to settlement owing to its arid nature. A compact mass, the continent shows marked physical and climatic resemblances to South Africa, and, like the latter, has few indentations. The only really large opening is the Gulf of Carpentaria, in the north, for the Great Australian Bight, in proportion to its width, makes a relatively slight entry in the south.

In remote ages Australia was joined to Asia, but its separation was effected at a very early period. Before this took place the continental shelf which stretches from the north coast of Australia towards South-East Asia, and is now covered by shallow seas, was probably dry land. On the south the shelf extends beyond Tasmania; on the north-east its edge is marked by the Great Barrier Reef.

STRUCTURE AND RELIEF

Australia may be divided into three main physical regions.

(1) **The Western Plateau,** occupying more than half of Australia, is an ancient, much denuded crust-block. It varies in height from

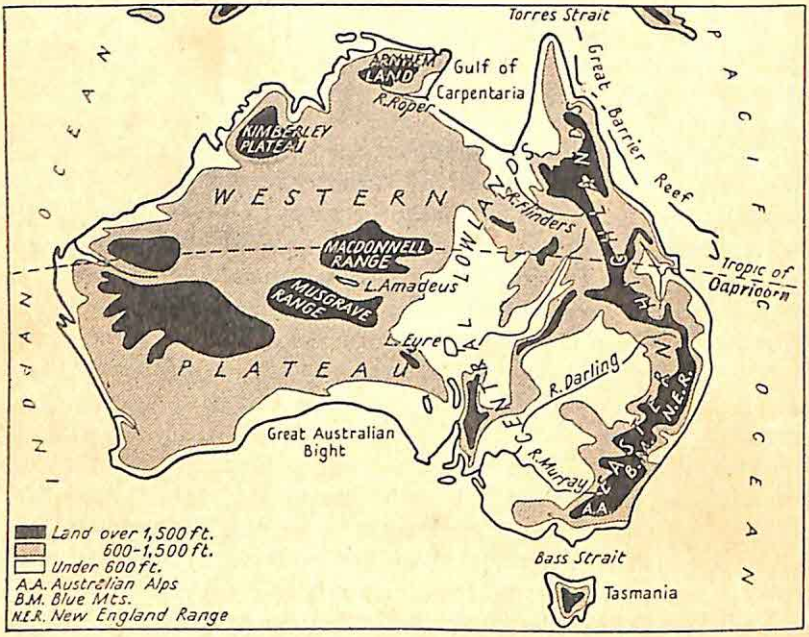


FIG. 283. Australia: Physical Features.

600 to 1,500 feet, though here and there ranges, like the Macdonnell and Musgrave Ranges, bulge above the general level.

(2) **The Eastern Highlands,** or Great Dividing Range, form the eastern edge of the Western Plateau, extending along the Pacific coast from Cape York almost to the mouth of the Murray. The Highlands slope gradually to the interior, but on their seaward side rise from the plains by steep escarpments, which form barriers to climatic influences and communications.

(3) **The Central Lowlands,** stretching from the Gulf of Carpentaria to the south coast, which they reach round the mouth of the Murray, may be divided into (*a*) the Murray-Darling Lowlands,

(*b*) the Lake Eyre Basin, part of the inland drainage area of Australia, and (*c*) the Carpentaria Lowlands drained to the Gulf of Carpentaria.

Rivers. A number of relatively short, swift rivers, like the Hawkesbury, Fitzroy, and Burdekin rivers, flow from the Eastern Highlands into the Pacific. The Flinders and the Roper drain into the Gulf of Carpentaria. On the west coast the chief rivers are the

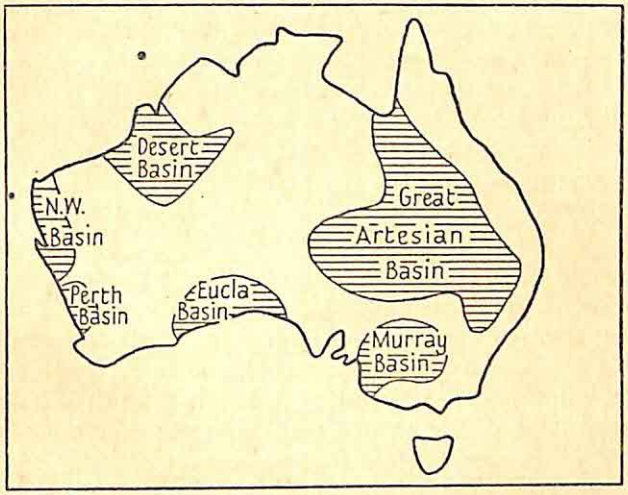


FIG. 284. Australia: Artesian Basins (after Griffith Taylor).

Victoria, navigable for 100 miles, Fitzroy, Murchison, and Swan Rivers, which fall into the Indian Ocean.

The principal river is the Murray, which enters the sea through Lake Alexandrina, a shallow lagoon almost separated from the sea by a sandspit which prevents access by ocean-going vessels. Like its tributaries the Darling and Murrumbidgee, the Murray is navigable at certain seasons, but the chief value of these and other streams is for irrigation.

It is improbable that the greater part of the arid interior of Australia will ever be reclaimed, though in certain areas a transformation has been wrought by sinking *artesian wells*. Such wells are sunk to obtain water imprisoned, often at great depths, between impervious rock strata. A hole is bored by means of a drill, and when the supply is reached pressure is released and the water rushes to the surface.

A right-angled iron pipe is inserted at the head of the bore, and the water flows into a pool, from which shallow channels lead it over the land. The Great Artesian Basin, which covers an area of over half a million square miles, stretches from the Gulf of Carpentaria, across the Central Lowlands, through Queensland into New South Wales. The sinking of artesian wells has enabled this vast region to be developed for stock rearing, and has made it possible for the great stock routes to be kept open, even during exceptionally dry periods. Other artesian basins, as yet little developed, are the Murray Basin; the Eucla Basin, stretching inland from Eucla, on the Great Australian Bight; the Perth Basin; the North-West Basin, round Shark's Bay on the west coast; and the Desert Basin, extending for 400 miles east of Broome.

CLIMATE

The whole of Australia lies north of 40° S., which corresponds to the latitude of Southern Italy, while somewhat more than one-third is situated north of the Tropic of Capricorn. Thus nowhere, except in the highlands, is Australia really cold, and in the north temperatures are uniformly high. Most of Australia lies in the belt of the south-east trades, which, though they cause adequate rainfall on the windward slopes of the eastern Highlands, blow over the greater part of the continent as dry winds. The comparatively light rainfall is associated with absence of clouds and abundant sunshine. The average number of hours of sunshine per year at Perth is 2,810, compared with 1,480 in Eastern England.

Temperature. In *January* (summer) almost the whole of Australia has a temperature of over 72° F. North of the tropic temperatures exceed 80° F., and in the interior they are well over 90° F.

In *July* (winter) most of the region north of the tropic has a temperature of over 64° F. and is thus warmer than the South of England in summer. Nowhere south of the tropic (except in the highlands) is the mean July temperature less than 48° F., though on winter nights frosts occur, for in the dry clear air heat radiates rapidly.

Rainfall. As we have seen, the south-east trades precipitate most of their moisture on the windward side of the Eastern Highlands, becoming drier and drier as they blow over the interior. Rainfall decreases rapidly westward, and rain only occurs at rare intervals

during thunder-storms. The movement of the wind and rainfall belts, which move north and south with the apparent movements of the sun, affects the rainfall.

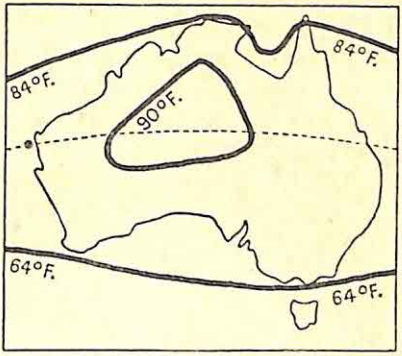


FIG. 285. Australia: January (Summer) Temperature.

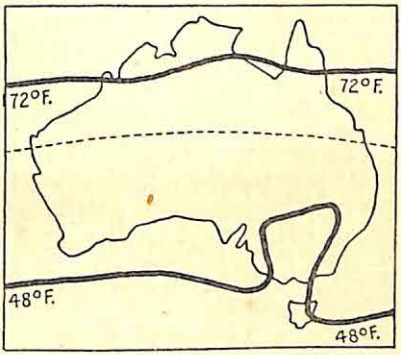


FIG. 286. Australia: July (Winter) Temperature.

(1) *Summer conditions.* In the Australian summer the wind belts move south with the apparent movements of the sun.

(*a*) The south-east trades now blow on-shore along nearly the whole of the east coast, causing rain, which is especially heavy in the north.

(*b*) In the extreme south the winds blow off-shore and little rain falls.

(*c*) The interior of the continent is extremely hot, forming a region of low pressure with in-flowing winds. In the north of Australia monsoon winds, blowing from South-East Asia across the Indian Ocean, cause heavy rains to fall.

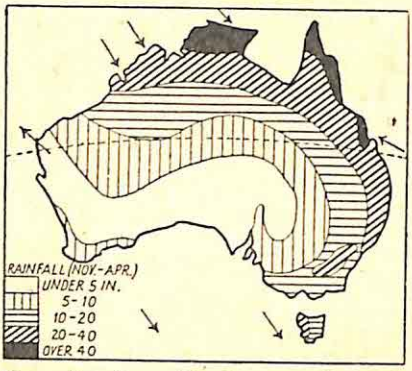


FIG. 287. Australia: Summer Rainfall.

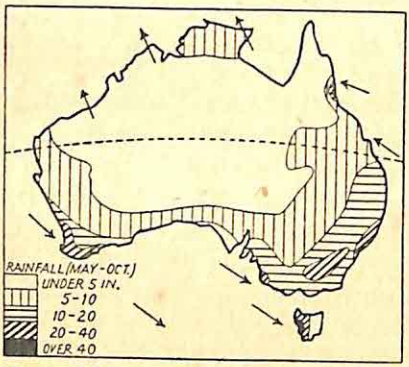


FIG. 288. Australia: Winter Rainfall.

Tasmania, lying in the brave west-wind belt at all seasons, receives rain throughout the year, especially on the western slopes of the mountains, which are much wetter than the leeward slopes.

(2) *Winter Conditions.* In the Australian winter, when the sun is overhead at noon somewhere between the equator and the Tropic of Cancer, the wind and rainfall belts move north.

(*a*) The extreme south of Australia now lies in the west-wind belt

of variable rains. Like the south-west of Africa and Central Chile, it has a typical Mediterranean climate.

(*b*) The east coast-lands, from the south of Queensland northwards, receive winter rains from the on-shore south-east trade winds.

(*c*) In the north of Australia the south-east trade winds, in winter, blow off-shore towards South-East Asia, and thus at this season the northern part of the continent is dry.

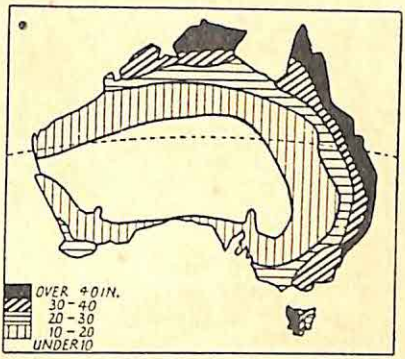


FIG. 289. Australia: Mean Annual Rainfall.

NATURAL VEGETATION AND WILD ANIMALS

Owing to the long isolation of Australia, many primitive forms of animal life have survived; while numbers of its plants are quite different from those in other parts of the world. The animals include specimens of the early mammals, including the marsupials like the kangaroo and the opossum, both of which carry their young in a pouch; and the platypus, an amphibious animal which has a bill like a duck and webbed feet and, though a mammal, lays eggs like reptiles. The echidna or Australian ant-eater resembles a large hedgehog; and the koala is a small tree-climbing bear. Among the birds in the northern forests are the crested cockatoo and the lyre bird, which has remarkable powers of mimicry. Many of the plants go back to the Mesozoic period. The lily, honeysuckle, tulip, and other plants are found in Australia as trees. The most typical Australian tree is the eucalyptus, of which there are several hundred varieties. These trees shed their bark instead of their leaves, which hang edgewise to the sun to reduce evaporation.

A comparison of the rainfall (Fig. 289) and vegetation maps

(Fig. 290) shows that there is a close connexion between the two. Roughly, the different vegetation belts occur in concentric circles around the arid interior, increasing in luxuriance with increasing rainfall.

Belts of *tropical forest* occur along the north and north-east coasts,

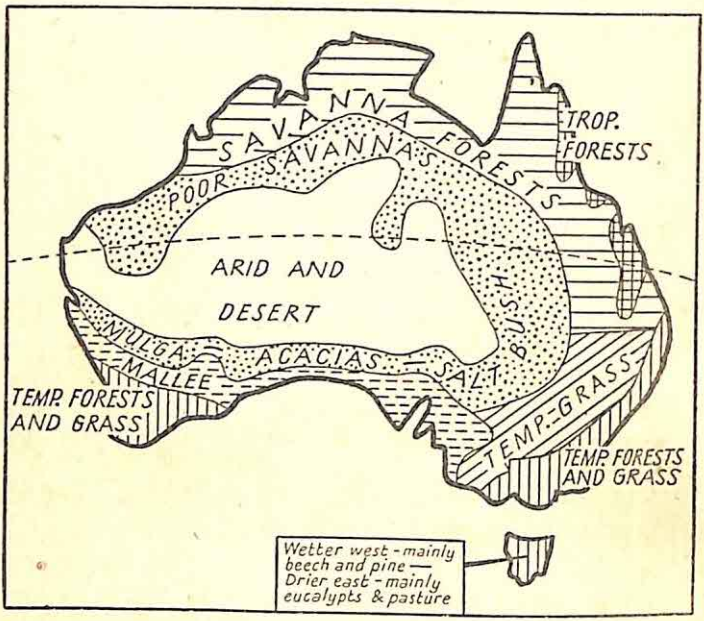


FIG. 290. Australia: Natural Vegetation.

where the monsoon rains last for five months and the annual rainfall is about 65 inches. But these forests are not continuous, being interspersed with stretches of more open savannas.

Savanna forests cover the greater part of the monsoon rain area, while on the east they extend southwards into the north of New South Wales. They consist mainly of grass-lands with eucalypts. As the rainfall decreases towards the interior, the savanna forests merge into true savannas, which gradually merge into the belt of salt bush on the desert margin.

In the *desert* itself, with its long, wind-swept ridges of reddish sand, the vegetation consists of mulga and porcupine grass, though after

very rare rain-storms it is transformed and, for a brief space, is clad with a vivid carpet of green vegetation.

The *warm temperate rain forests* of the south-west and south-east consist of rich grass-land with many eucalyptus trees. The former region is the richest timber area in Australia.

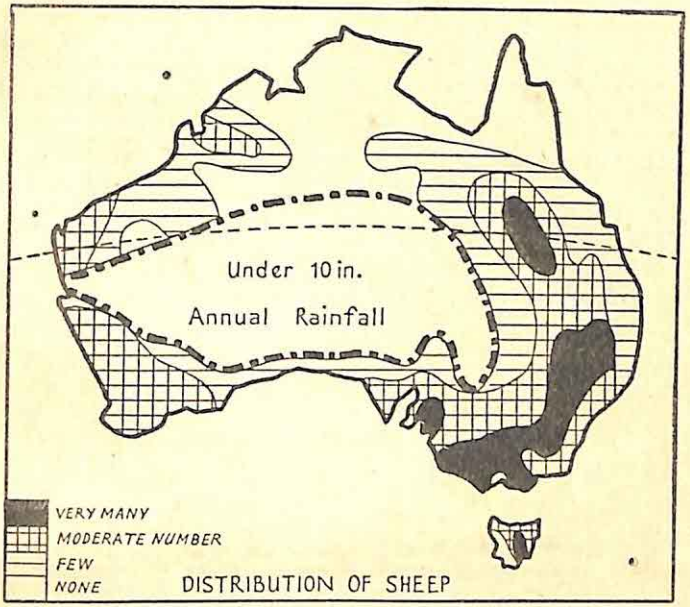


FIG. 291. Australia: Distribution of Sheep.

Much of the Murray-Darling Basin consists of *grass-lands*. As the rainfall decreases towards the west, these natural pastures pass into the *Mallee Scrub* (eucalypts) that margins the Great Australian Bight and extends, north of the south-west forest, to the west coast.

Tasmania has much *forest* land. In the wetter west the chief trees are beech and pine; but in the drier east eucalypts predominate.

CROPS AND ANIMALS

Australia is the chief *sheep-producing* country in the world. The climate is admirably suited to sheep, which thrive in dry areas where the rainfall is between 10 and 20 inches per annum, and the summer

temperatures do not exceed 75° F. For these reasons few sheep are found along the east coast-lands, where the damp climate is better suited to dairy cattle; in the north, where temperatures are too high; or in the interior, where the rainfall is under 10 inches per annum. Apart from these regions, sheep are widely spread. The main sheep

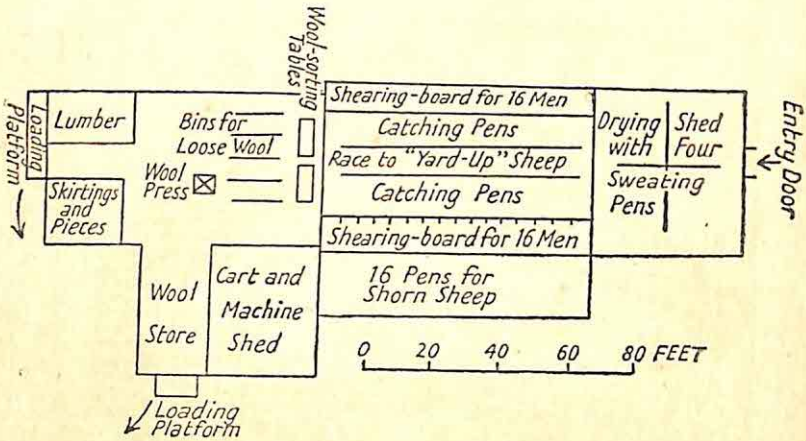


FIG. 292. Plan of an Australian Wool-shed.

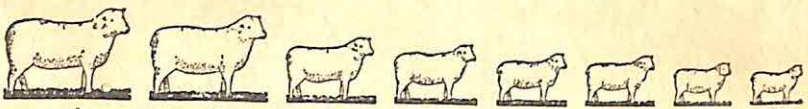


FIG. 293. Comparative Output of Sheep.
1. Australia; 2. U.S.S.R.; 3. U.S.A.; 4. South Africa; 5. Argentine; 6. New Zealand; 7. British Isles; 8. British India.

belt lies on the leeward side of the Eastern Highlands, stretching from the Murray Basin northward to Central Queensland. Within this area New South Wales has nearly half of the 114,000,000 sheep (1938) in Australia, and this state also carries the greatest number per square mile. In the drier regions there are fewer sheep to the square mile; the farms are larger, some having an area of over 50,000 acres. In districts where the rainfall is relatively great sheep are grazed both for wool and mutton: in those with small rainfall they are bred mainly for wool.

The sheep are sheared in spring, and the bales of wool are

conveyed by large motor-wagons (with or without trailers) to the nearest railway, whence they are dispatched to the port of export. Sydney and Melbourne are the leading wool markets of the world, though London is still an important centre. Great Britain and Japan are the chief importers of Australian wool. In addition to

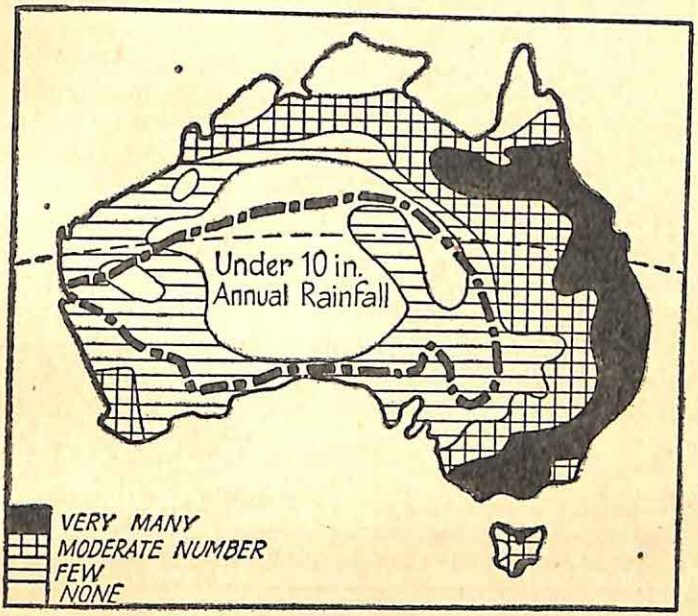


FIG. 294. Australia: Distribution of Cattle.

mutton, by-products of the sheep industry include skins tanned for leather, horns, hoofs, and tallow.

There are 13,500,000 (1938) *cattle* in Australia, of which about 75 per cent. are bred for beef and the rest for dairy purposes. Cattle require more moisture than sheep, but are better able to withstand high temperatures. The chief producing areas are in the wetter north and along the coastal plains of the east. Nearly half the beef cattle are bred in Queensland, where a great proportion are pastured in the great Artesian Basin.

The principal dairying regions are in the wetter south-east, especially in the lowlands near the coast, where the annual rainfall

exceeds 30 inches. Eighty per cent. of the milk is made into butter, which ranks fourth in the export list. Somewhat less than half is used in Australia, and of the remainder the greater part is exported to Great Britain, while some is marketed in the Dutch East Indies.

The introduction of refrigeration revolutionized the sheep and

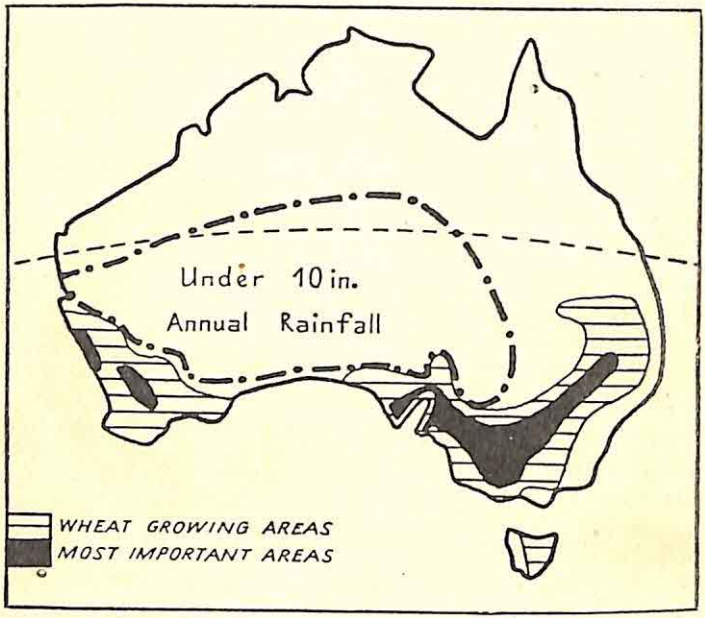


FIG. 295. Australia: Distribution of Wheat.

cattle industries in areas of large-scale production. It is only since the advent of refrigeration that Australia has been able to export chilled and frozen beef and mutton and dairy products—butter, cheese, and eggs. Nearly the whole of Australia's surplus beef, mutton, and lamb is exported to Great Britain.

Since the beginning of the present century the amount of land devoted to agriculture in Australia has more than doubled. *Wheat* alone now occupies 70 per cent. of the total area under cultivation. With the exception of a comparatively small acreage in Queensland, the crop is confined entirely to temperate Australia. The greater part is produced in areas having an annual rainfall between 20 and 30 inches; and none is grown where the rainfall is less than 10

inches. An important grain belt extends from the district north of Adelaide, in South Australia, eastward through Victoria and New South Wales. The south-west of Western Australia is another wheat-growing region.

The mild, sunny climate favours *fruit farming*. Much fruit is grown, especially on irrigated lands in the Murray basin, where apricots, peaches, and pears are dried or canned for export. Vines, too, are grown both for currants and raisins, and, in districts such as the hills round Adelaide, for wine. Oranges and other citrous fruits are cultivated on the coast-lands and irrigated areas of New South Wales; pineapples on the tropical lowlands of Queensland; Tasmania, with its cooler, damper climate, produces half the apple crop of the Commonwealth. There are many sugar plantations at widely spaced intervals along the Queensland coast. The cane is grown and the sugar produced entirely by white labour, and the industry is controlled by the Government through high tariffs, wages boards, and price-fixing awards. A little over half the output of Queensland is now sufficient for the entire needs of Australia, and the surplus sugar is exported mainly to Great Britain and Canada. Since 1920 an increasing amount of cotton has also been cultivated in Queensland.

MINERALS

Australia is rich in minerals, especially gold, coal, silver, lead, zinc, copper, and tin. The Australian mines, unlike those of South Africa, are worked entirely by white labour. At the present time Western Australia produces nearly 75 per cent. of the Commonwealth's total output of *gold*. In this State the mineral is found mainly in the south-west, the chief mines lying in the desert region, to which water has to be conveyed through pipes from a reservoir near Perth, 300 miles distant from the nearest mine. Among the principal centres are Southern Cross, Boulder, Mount Margaret, and Kalgoorlie, where, owing to increased world prices, mining has recently been revived. All these places are situated on the main or branch lines of the Trans-Continental Railway from Perth to Port Augusta. Another line connects the chief centres on the Murchison Field with Geraldton; while farther north the Pilbara gold-field lies fairly close to the coast. In addition to Ballarat and Bendigo (Victoria), gold is also mined at Gympie and Mount Morgan in South-East Queensland; at Mount Lyell in Tasmania; and at Bulolo (Territory of New Guinea).

The name Broken Hill (New South Wales) is synonymous with *silver*, *lead*, and *zinc*, for which it is one of the most famous mining centres in the world. The ores are sent by rail to Port Pirie, where the silver and lead are smelted. Much of the zinc is shipped to

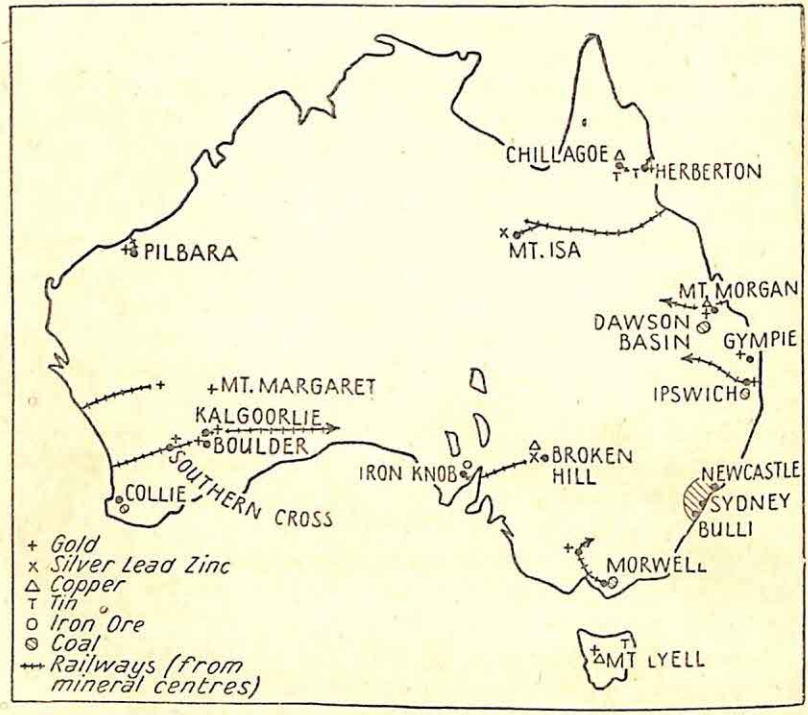


FIG. 296. Australia: Distribution of Minerals.

Risdon (near Hobart), whose falls supply the cheap electricity essential for its electrolytic-zinc industry. The Mount Isa Field, 600 miles inland by rail from Townsville, Queensland, is also important for silver-lead.

Copper also is mined at Broken Hill, as well as at Mount Morgan and Chillagoe, in Queensland, and Mount Lyell, in Tasmania. *Tin* is obtained in the north-east of Tasmania; and at Herberton and Chillagoe, in Queensland. Iron Knob, in the Eyre Peninsula, is noted for *iron ore*, which is sent to the coast and thence shipped to the blast furnaces of Newcastle.

The *New South Wales Coal Basin*, the most important in the Southern Hemisphere, extends from Sydney, north to Newcastle and south to Bulli. The coal lies close to the coast, which thus facilitates export. Ipswich, some miles up the Brisbane river, and the Dawson Basin are important centres in South-East Queensland;

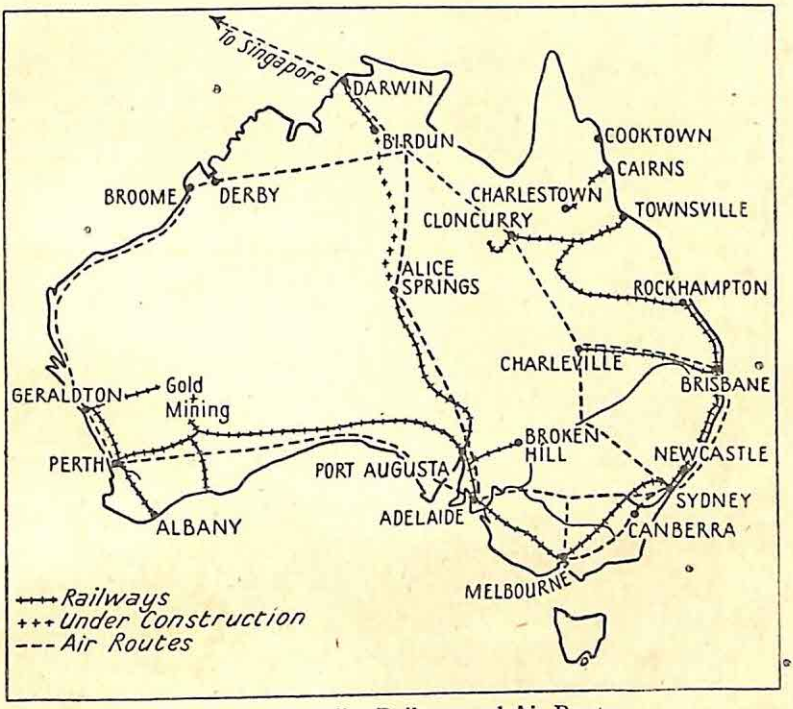


FIG. 297. Australia: Railway and Air Routes.

while coal is also mined at Morwell, some 80 miles east of Melbourne; and at Collie, not far from the port of Bunbury, in the south-west of Western Australia. Some of the coal is, however, of rather poor quality.

COMMUNICATIONS

The distribution of minerals, especially gold, had a great effect on the development of railways in Australia. Apart from their immediate purpose, the lines built from the ports to inland mining centres played no small part in the opening up of the country.

Unfortunately, when railway construction was first undertaken no standard gauge was decided on for the whole of Australia, and as a result there are at the present time four different gauges.[1] Thus a railway journey from Perth to Brisbane, 3,500 miles, takes 170 hours (or twice as long as to cover the same distance from New York to San Francisco) on account of five changes of gauge and six changes of train.

Air Transport. In a country so isolated, and with such great internal distances as Australia, aviation is destined to play an increasingly important part in both overseas and inland communications. Great advances have been made in recent years, and fortunately the terrain and general climatic conditions favour flying operations.

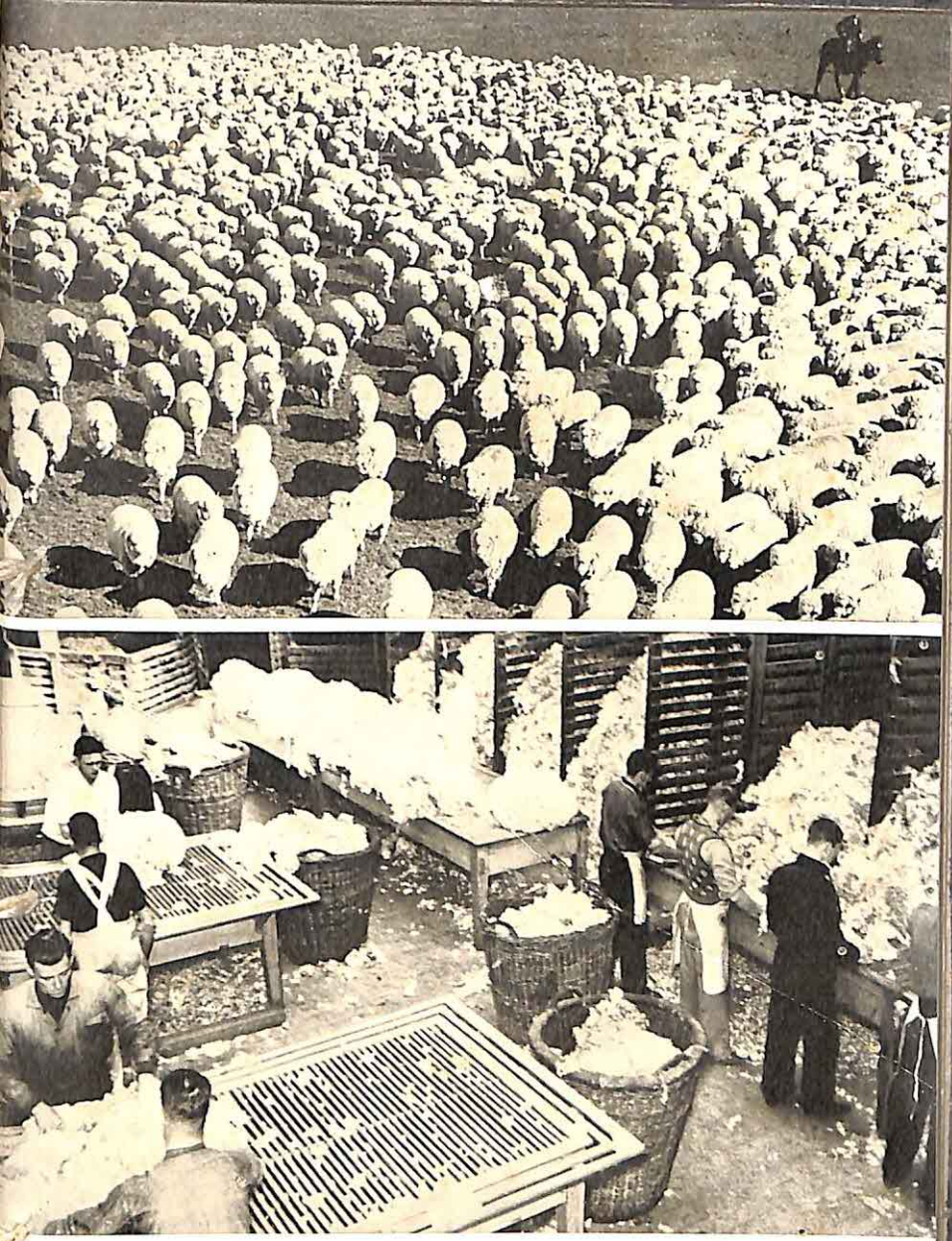
There is a thrice weekly mail and passenger service between Australia and England via Sydney, Brisbane, Darwin, and Singapore. From Hobart, Perth, Melbourne, and Adelaide connexion with this main trunk service is made at Darwin. Canberra and all the state capitals, including Hobart, are linked by air. There is a regular service between Australia and the Mandated Territory of New Guinea for the conveyance not only of passengers and mail, but of heavy freight between certain ports and the gold-mining area, some 70 miles inland.

POLITICAL DIVISIONS AND DISTRIBUTION OF POPULATION

The Commonwealth of Australia consists of the states of *New South Wales*, *Victoria*, *Queensland*, *Western Australia*, and *Tasmania*; together with the *Northern Territory* and the *Federal Capital Territory* around Canberra (940 square miles). Out of a total population of 6,700,000 (1935), nearly 45 per cent. live in the five state capitals of Sydney, Melbourne, Brisbane, Adelaide, and Perth. All these great cities are ports, and as the wealth of the country lies largely in its export trade, it is in these busy centres that the majority of the people find employment.

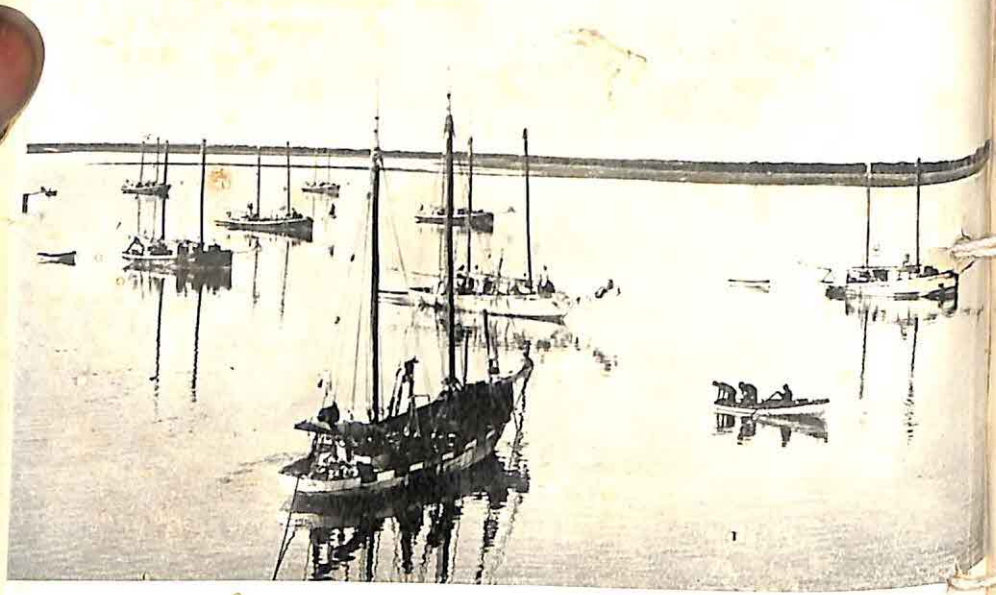
Climatic conditions, especially rainfall, provide the key to the general distribution of the population. At least four-fifths of the

[1] *Gauges*: New South Wales and Federal Lines 4 ft. 8½ in.; Victoria and South Australia 5 ft. 3 in.; Queensland 3 ft. 6 in. and 2 ft.; Western Australia and Tasmania 3 ft. 6 in.



45. SHEEP IN AUSTRALIA

(*Above*) Mustering sheep on a New South Wales 'station', ready for dipping or shearing. (*Below*) 'Classers' woolrolling and classing the wool ready to be baled and dispatched to the wool markets at Sydney, whence much will be exported to London.



46. THE AUSTRALIAN COAST

(*Above*) The Great Barrier Reef of Australia at low tide. Stretching for 1,200 miles along the coast of Queensland, it is the work of coral polyps. (*Below*) Pearling luggers off the coast of North-West Australia.

inhabitants live in well-watered regions along the temperate coastal belt of the east and south-east, and in the south-west corner of Western Australia. The arid interior, with an annual rainfall of less than 10 inches, and comprising over one-third of the country, is sparsely populated, while the tropical north is probably unsuited to

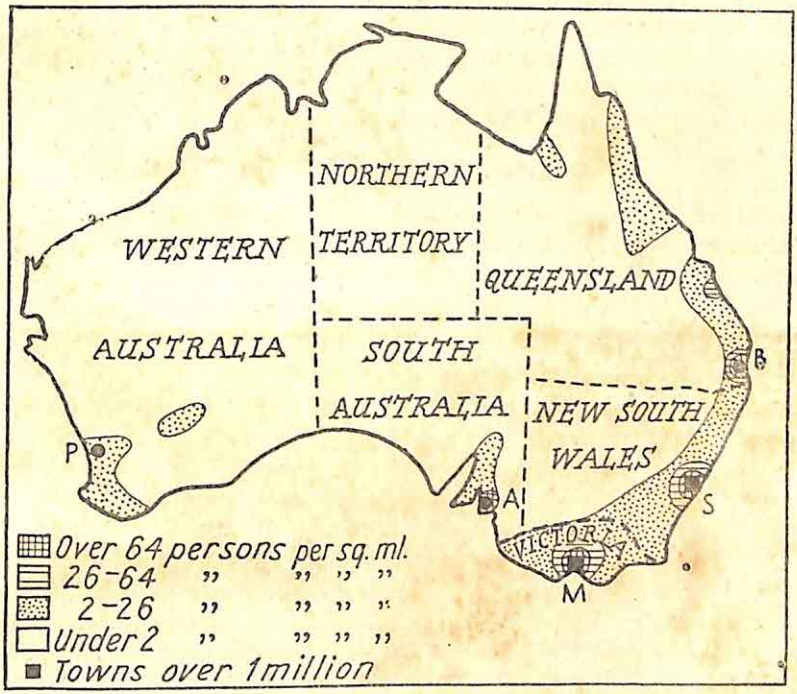


FIG. 298. Australia: Distribution of Population.

close white settlement, though the people living in the north are usually strong and healthy. In the Northern Territory (523,620 square miles), which includes a considerable proportion of both arid and tropical belts, the total population is only 23,000, including some 18,000 aborigines. The attempt to develop large-scale ranching in the hinterland of Darwin has not been successful, partly owing to labour difficulties.

The white labourers exclusively employed on Queensland sugar plantations, performing such tasks as cutting canes under a blazing

tropical sun, or toiling in the steamy atmosphere of the filter presses, command high wages for their arduous work. The average Queensland cane cutter earns as much in a day (25*s.* to 30*s.*) as a native cutter in Java gets in a month. Thus in Queensland production costs are high in the sugar industry, which is aided by subsidies and protective tariffs. But this industry has proved that it is possible to provide agricultural employment for white people working under tropical conditions, and thus supports Australia's contention that it is possible to colonize her tropical areas with whites and so retain the whole continent as 'A White Australia'.

REGIONS OF AUSTRALIA

South-Eastern Australia. Politically South-Eastern Australia comprises New South Wales, Victoria, and the south-east of South Australia. This portion of the continent falls into five Natural Regions: (1) the Eastern Highlands; (2) the East Coast Lowlands; (3) the Great Victoria Valley; (4) the Murray-Darling Basin; and (5) the South-East of South Australia.

(1) **The Eastern Highlands** rise steeply from the narrow coastal plain. In the north they form the New England and Liverpool Ranges, in the centre the Blue Mountains, and farther south the Australian Alps, beyond which they trend west and, running parallel to the coast, form the Victorian Highlands. These Highlands are a barrier to moisture-laden on-shore winds, and also a handicap to communications between the coastal belts and the interior plains of the Murray-Darling Basin.

(2) **The East Coast Lowlands** are the most densely peopled part of New South Wales. The rainfall varies from 30 to 50 inches, being greater in the north, where it is heaviest in the summer months. This damp climate favours dairying, but is unsuited to wheat; and though sheep are bred on the uplands, few are found on the lowlands. Maize and sugar-cane, both of which require a high summer temperature and abundant moisture, are grown in the warmer, wetter north. Temperate fruits are cultivated in the cooler south. *Sydney* (1¼ millions), the capital of New South Wales, stands in the centre of the Great Coal Basin, on the magnificent silt-free harbour of Port Jackson. Railways run north and south along the coast, and north-west and south-west across the highlands to the Murray Basin, for which Sydney is one of the chief outlets. A large proportion of the

Australian wool is exported from Sydney, which is the principal wool market in the world. Other exports include butter, wheat, flour, fruit, and coal. *Newcastle*, a leading coal port, is one of the chief engineering centres in Australia. The *Federal Capital Territory*, around *Canberra*, the Commonwealth capital, was carved out of New South Wales.

(3) **The Great Victoria Valley** lies between the Victorian

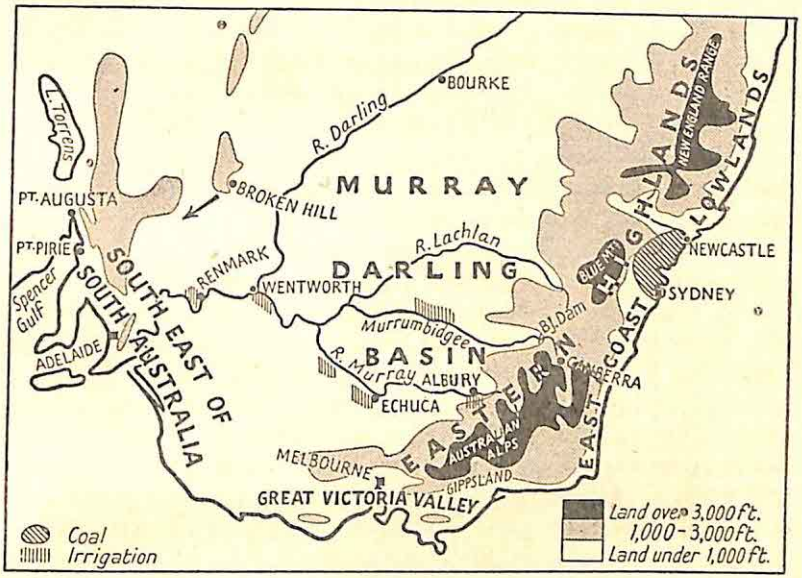


FIG. 299. South-Eastern Australia.

Highlands and the Otway Range and Gippsland Hills, running west and east respectively from Port Phillip Bay. Dairying and mixed wheat and sheep farming are important. Coal is mined at Morwell and lignite in the Gippsland Hills. Steamers of fair size can ascend the Yarra to *Melbourne* (1,000,000), the capital of Victoria, but larger vessels tie up at the piers or wharves of *Port Melbourne*, or dock at *Geelong*, a woollen-manufacturing centre, on the west side of Port Phillip Bay. Melbourne is the outlet for the Victoria Valley and the southern part of the Murray Basin. It ranks second to Sydney in size and as a wool market, and (except for coal) its exports are similar.

(4) **The Murray-Darling Basin** occupies about one-fifth of

Australia. The Murray, Darling, and Murrumbidgee are intermittently navigable. Vessels can ascend the Murray to Albury, 1,400 miles (from July to January inclusive), and the Darling for over 1,100 miles above *Wentworth*. *Morgan*, on the lower Murray; Wentworth; *Echuca*, on the Middle Murray, and *Bourke*, a stock centre on the Darling, collect river-borne produce, such as wool and grain, and forward it by rail to the nearest seaport, and ship stores up-stream for towns and settlements along the banks of the rivers.

The alluvial plains of the Murray Basin only need irrigating to make them yield rich crops. Dams, like the Burrinjuck Dam, on the upper Murrumbidgee (N.S.W.), and reservoirs have been constructed to increase the water supplies available for this purpose. Much fruit is grown on irrigated areas round *Renmark* (South Australia), and in the Riverina, the district lying between the Murray and the Murrumbidgee, also noted for wheat and sheep.

(5) **The South-East of South Australia** is the only really productive region in a state more than four times the size of Great Britain, but whose total population does not exceed 600,000. Somewhat more than half the people live in *Adelaide*, the capital, a few miles from Port Adelaide, on the Gulf of St. Vincent, which exports much of the produce of the Lower Murray. *Port Pirie*, on the east side of Spencer Gulf, the outlet for the famous Broken Hill mines, is the present terminus of the transcontinental railway from Perth, and the future terminus of the south to north line now under construction. *Whyalla*, on the west side of Spencer Gulf, exports iron ore from Iron Knob, 40 miles inland. *Port Augusta*, at the head of the Gulf, exports the wool and wheat that are grown in its extensive but dry hinterland.

Queensland. Though Queensland is the second largest state in the Commonwealth, its population is less than a million. Along the east coast the *Great Barrier Reef* extends from Torres Strait for 1,200 miles to about latitude 26° S. This belt of coral, from 10 to 90 miles wide, really consists of a number of reefs, many of which are separated by waters deep enough to admit the passage of large vessels.

Queensland may be divided into three Natural Regions: (1) the Coastal Lowlands; (2) the Eastern Highlands, known as the Great Dividing Range in the north, and the Darling Downs in the south; and (3) the Interior Plains, lying mainly in the Great Artesian Basin.

(1) **The Coastal Lowlands,** hot and wet throughout the year, especially in the north, are well suited to tropical agriculture, carried on exclusively by white labour. Bananas, pineapples, cotton, and

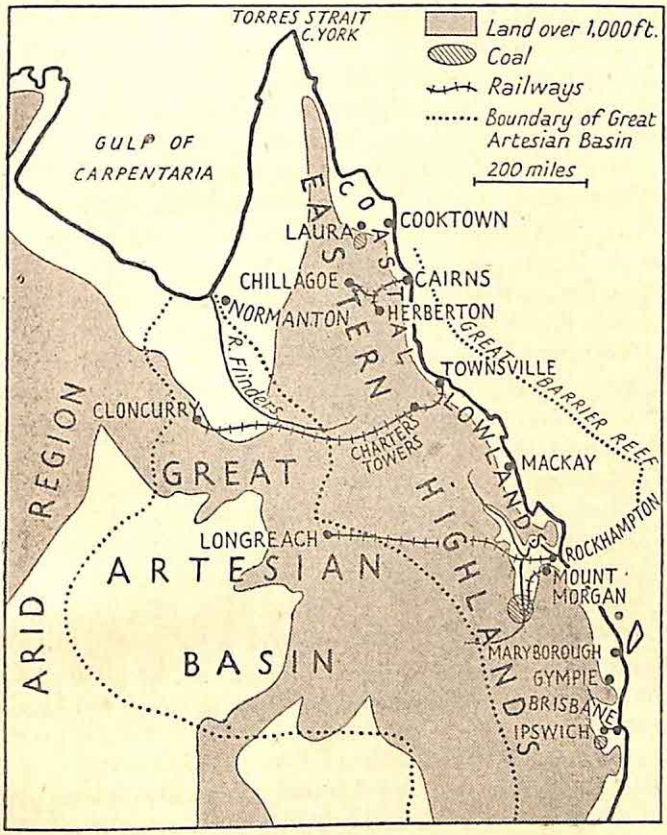


FIG. 300. Queensland.

sugar-cane are grown on the lowlands and maize at higher elevations. The cane plantations all lie within 30 miles of the coast between latitudes 16° and 30° S. The chief centres, separated by great distances, are *Cairns*, *Mackay*, *Bundaberg*, and *Maryborough*. Cattle, too, are bred on the lowlands and slopes of the highlands: the bulk are reared for beef, but some dairying is carried on in the

cooler south-east. Coal is mined in the basin of the Brisbane river, round *Ipswich*, and in that of the Dawson, a tributary of the Fitzroy.

Most of the people live in the coastal belt, where the chief towns, ports of moderate size, are situated. From these centres the earlier railways ran inland to the pastoral, mining, and agricultural areas, but now lines also run along the coast from Brisbane as far north as Cairns. *Brisbane* (300,000), the capital of Queensland, and only large town, situated some 12 miles up the Brisbane river, is the outlet for Southern Queensland and the adjacent districts of New South Wales. Meat-canning and stock-exporting ports are *Rockhampton*, on the Fitzroy river, and *Townsville*, farther north, whence a railway runs inland, through a rich cattle belt, to the gold-mining centres of *Charters Towers* and *Cloncurry*.

(2) **The Eastern Highlands** are broad, but comparatively low, with average elevations of from 2,000 to 3,000 feet. Cattle are bred on the wooded pastures, with sheep in the south. The chief mining centres lie in these uplands, including Mount Morgan,[1] noted for gold and copper; Mount Isa for silver-lead; Gympie for gold; Chillagoe and Herberton for tin.

(3) **The Interior Plains**, thanks to artesian wells, now form the main pastoral belt of Queensland. Almost half the cattle and nearly one-fifth of the Australian sheep are found in Queensland, and of these the majority are reared in this region.

Western Australia. Western Australia is the largest state in the Commonwealth, comprising nearly one-third of its total area. It is, however, the most thinly peopled, for it contains a considerable proportion of arid and desert land, while the fertile north-western region is as yet little developed. Climate is the key-note of Western Australia, which may be divided into three Natural Regions: (1) the Tropical North-West; (2) the Arid Region; and (3) the 'Mediterranean' South-West.

(1) **The Tropical North-West**, with summer rains, consists of open monsoon forests and savannas in the north which merge into arid regions on the east and south. Cattle ranching is the main occupation. Broome, like Roebourne to the south, is a centre for the pearl fisheries carried on along the coast.

(2) **The Arid Region** extends from the interior southward to the

[1] Mines were closed down, but reopened owing to increased price of gold.

Great Australian Bight, and westward to the coast between Roebourne and Geraldton. In spite of the low annual rainfall, which is under 10 inches, sheep are bred along the coast and on some of the plateaux in the interior where, owing to increased elevation, the rainfall is slightly greater. The mining centres on the Murchison

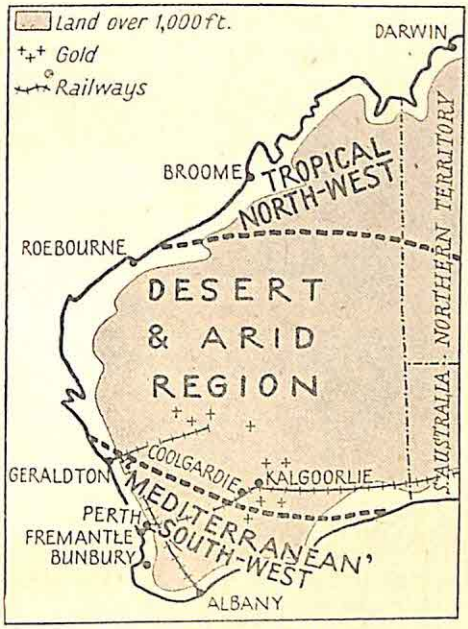


FIG. 301. Western Australia.

gold-field (see p. 485) are connected by rail with Geraldton. Farther south, *Boulder*, *Kalgoorlie*, and other gold centres lie on the main transcontinental railway or on branch lines.

(3) **The South-West Region**, with its Mediterranean climate, is the most productive and populous part of the state. The distribution of natural vegetation, crops, and animals depends almost entirely on rainfall. The extreme south-west, with an annual rainfall exceeding 30 inches, is well forested, its exports of timber—especially jarrah and karri—exceeding those of any other Australian state. In the cleared areas, especially to the south-west of Bunbury, are apple and orange orchards and vineyards. To the north-east of the timber

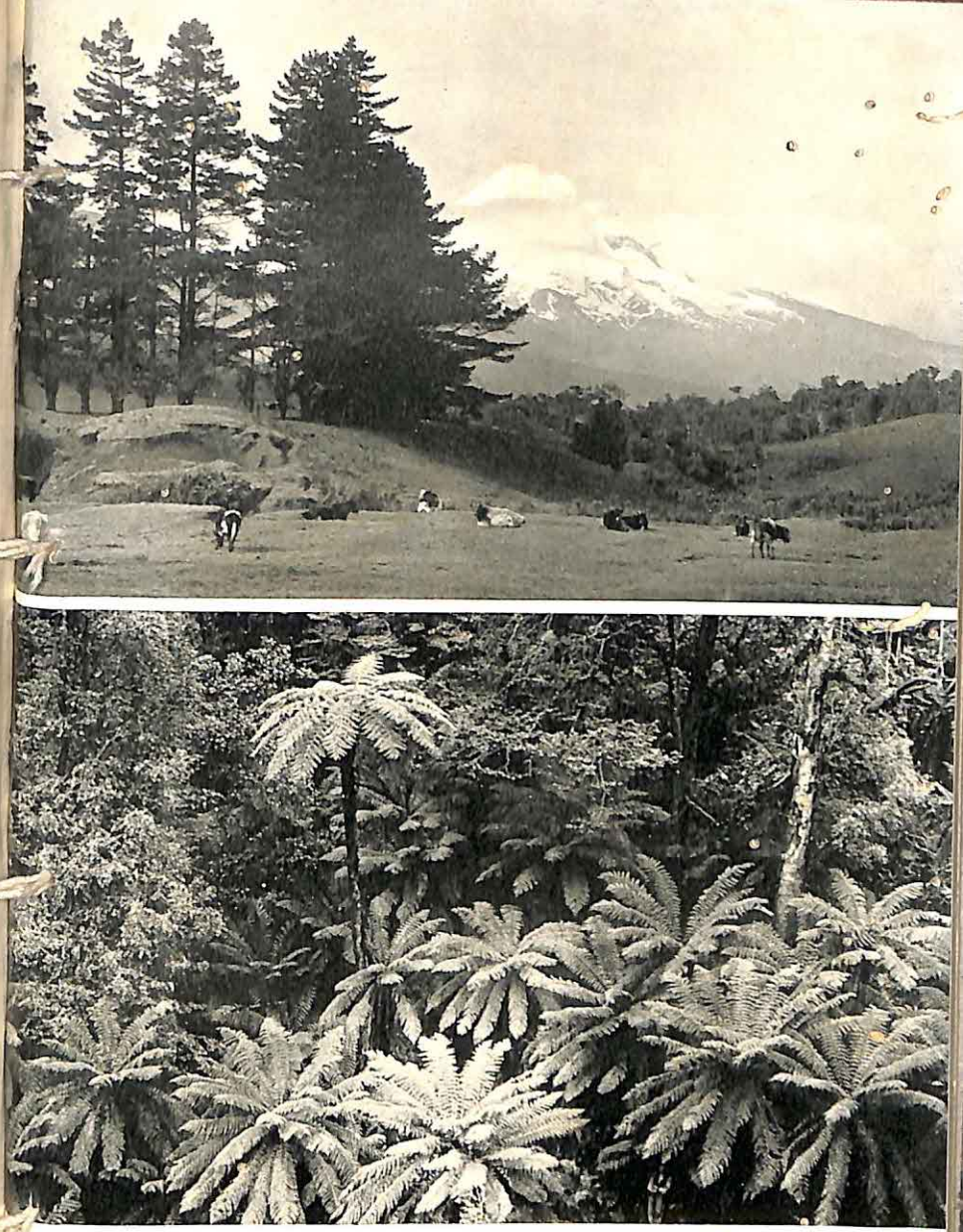
belt, where the rainfall ranges from 30 to 20 inches, is an agricultural and pastoral area with wheat, cattle, and sheep. In the succeeding and drier belt sheep are grazed on pastures which grow more and more scanty towards the arid interior, whose only wealth lies in its gold mines.

This region lies remote from the more populous states of the east, but the transcontinental railway and recent developments in air transport have both helped to lessen the effects of this isolation.

Out of a total population of 440,000 nearly half live in *Perth*, the capital, 10 miles up the shallow Swan River. Ocean vessels embark or disembark passengers, mails, and goods at *Fremantle*, which exports wheat, flour, wool, fruit, and gold. Apart from Perth, the remaining towns, including those already named, are small. Northam, in the wheat belt, is a junction where the railway from Albany, a small port in the south, joins the main transcontinental line.

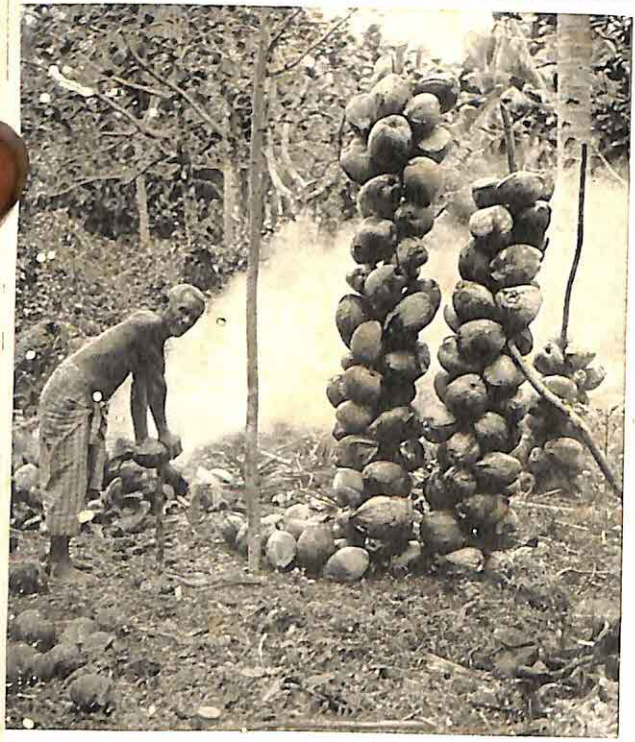
The Northern Territory. In the whole of the Northern Territory, whose area is slightly more than half a million square miles, there are—excluding 18,000 aborigines—only about 4,000 people. The monsoon forests of the north are gradually replaced by savannas, which grow poorer and poorer as they merge into the arid interior. Cattle rearing is the chief occupation: the principal ranching areas lie around the Roper and Victoria rivers, on the Barkley Tableland near the Queensland frontier, and around the Macdonnell Range in the interior, where the main centre is Alice Springs (the present northern railhead of the projected north-to-south transcontinental railway), whence stock are sent by rail to Port Augusta. Some pearl fishing is carried on in the shallow waters bordering the low northern coast, and a little mining in the district behind *Darwin*. This is the only port and, like Daly Waters, is a place of call for aircraft on the Sydney–Singapore air route. The transcontinental railway has been pushed southward from Darwin to Birdum, the present southern railhead.

Tasmania. The mountainous island of Tasmania, approximately equal in area to Eire, is separated from the Australian mainland by Bass Strait, 150 miles wide. The rugged rain-drenched western highlands are densely forested, mainly with beech and pine. In the less rugged and drier east eucalypts abound, and pastures clothe the lower slopes of valleys and hills. The many rivers, fed by abundant



47. NEW ZEALAND

(*Above*) The extinct volcano of Mount Egmont, its summit sheeted with snow, which dominates the pasture lands of the famous Taranaki dairying district in the North Island of New Zealand (see pp. 499 and 504). (*Below*) Tree ferns in a New Zealand Forest. Compare their height with that of the man sheltering in the foreground (see p. 501).



48. PACIFIC ISLANDS

(*Above*) The 'High' volcanic island of Tahiti. Note the coco-nut palms on the 'Low' coral island to the right. The islands of the South Pacific are famed for their coco-nut palms. (*Below*) A native of Samoa removing fibre from the kernels of coco-nuts. The kernels are left to dry in the sun. They are then split open, and, after being sun-dried, the copra is extracted and dried either in the sun or by artificial means.

rains and perennial snows, provide ample power for the generation of electricity and furnish channels for transporting logs to the saw-mills. Oats and potatoes are grown, and cattle are bred on the coast-lands of the north. Sheep are grazed in the more sheltered Tamar Valley, and in the drier east.

Tasmania is famous for its apples, its crops accounting for more than half the Commonwealth's total export of this fruit. Many of the orchards lie round *Hobart*, the capital, in the Derwent Valley, which, in addition to exporting apples, preserves and cans quantities of other cool temperate fruits. From Hobart a line runs northward through the centre of the island to *Launceston*, on the Tamar estuary, the chief port in the north.

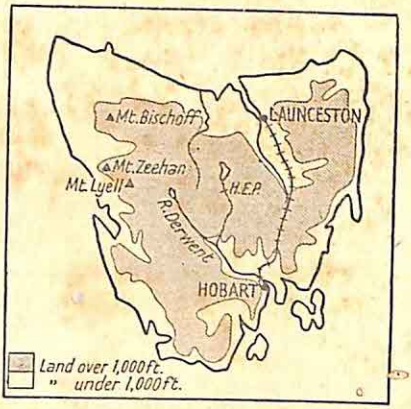


FIG. 302. Tasmania.

In the Western Highlands the mines of Mount Bischoff yield tin, those of Mount Zeehan copper, and Mount Lyell is the most famous copper-mining centre in the Commonwealth. Risdon, near Hobart, utilizes cheap hydro-electric power, with zinc from Broken Hill, in its electrolytic-zinc works.

EXERCISES

1. (*a*) On a sketch-map of Australia indicate the chief wheat-growing areas. (*b*) Under the following headings, write an account of wheat production in Australia: Climatic conditions; Areas of production as shown on your sketch-map; Months when crop is (i) sown, and (ii) harvested; Three ports of export; Approximate date of arrival in England.

2. Draw a sketch-map of Australia showing the principal belts of Natural Vegetation. Write brief descriptions of *two* of them.

3. How do you account for the fact that Australia is the most important sheep-rearing country in the world? On a sketch-map of Australia show the chief sheep-rearing districts.

4. (*a*) Discuss the importance of the Murray and its tributaries as regards: (i) Navigation and (ii) Irrigation. (*b*) Name *three* important products (excluding minerals) obtained from the basin. Describe briefly the route by which *one* of these products is conveyed to the port of export. Illustrate your answer by a sketch-map.

5. (*a*) What do you mean by an artesian well? (*b*) Explain the importance of artesian wells in Australia, paying special attention to the Great Artesian Basin.

6. Describe some of the ways in which the Australian Government and people are attempting to solve one of their great problems of colonization—the question of 'A White Australia'.

7. From what areas in Australia are gold, silver, zinc, copper, tin, iron ore, and coal chiefly obtained? Give your answer in tabular form, and illustrate it by a sketch-map.

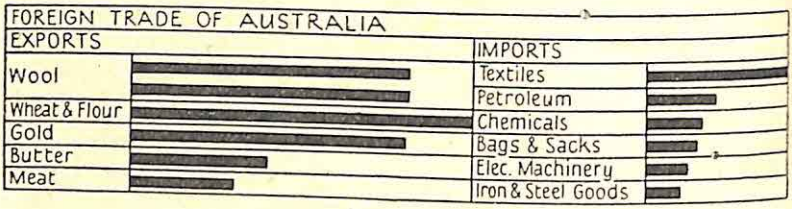


FIG. 303.

8. On a sketch-map of Australia (*a*) draw a line to enclose the area with less than 10 inches annual rainfall; (*b*) show by suitable shading (i) the most densely peopled areas; (ii) those with a moderate population; and (iii) those with few or no inhabitants. Account for the differences. (*c*) What proportion of the people of Australia live in the five great ports?

9. Give an account of the railway system of Australia and show how the position and direction of the chief routes are related to (*a*) relief, (*b*) the products of the interior, and (*c*) the location of the ports.

10. Name *four* important food products which Australia contributes to the needs of Great Britain. In each case name *one* area of production and describe the conditions favouring the product in this area.

11. Under the headings: (i) position, (ii) relief and climate, (iii) products, write an account of Tasmania.

12. Draw fully labelled sketch-maps to show the importance of Sydney, Melbourne, and Brisbane.

13. Fig. 303 shows the chief imports and exports of Australia. What can we learn from them about the geography of the country?

CHAPTER XXXIII

NEW ZEALAND

THE Dominion of New Zealand lies 1,200 miles east of Australia. It consists of the North and the South Islands separated by Cook Strait, the smaller Stewart Island, and a number of lesser islands in the South Pacific. The total area is slightly less than that of the British Isles, but the population is only 1,550,000. With the exception of some 75,000 Maoris, the people are almost entirely of British descent. The main islands extend from latitude 34° S. to latitude 47° S., a distance of approximately 900 miles.

Both the North and the South Islands are mountainous. The Southern Alps—young fold mountains—which form the backbone of the South Island, rise close to the west coast, but on the east are bordered by plains. The snow-clad summits of many peaks rise to over 10,000 feet, and Mount Cook (Aorangi) reaches 12,349 feet. The magnificent glaciers lying above the snow-line, which in the south-west descends to within 700 feet of the sea-level; the U-shaped valleys; the deep, steep-walled fiords of the south-west; and the long, narrow mountain lakes on the borders of the Otago Plateau (a much denuded area of ancient rocks), all remind us that the whole of this region was once heavily glaciated.

In the North Island other fold mountains, considerably lower than the Southern Alps, rise close to the east coast. In the centre of the island is a volcanic district with cones, hot springs, and geysers. The active volcanoes of Tongariro (6,458 feet), and Ruapehu (9,175 feet) lie south of Lake Taupo, which is drained northward by the Waikato, the longest and one of the few navigable rivers in New Zealand. In the south-west of the North Island rises the extinct volcanic cone of Mount Egmont.

Climate. New Zealand lies in approximately the same latitudes as Italy, but its climate, though of a modified Mediterranean type in the north, is greatly moderated by its insular position, resembling that of the warmer parts of the British Isles rather than that of the Mediterranean Lands.

The greater part of New Zealand lies in the belt of Westerly Winds,

which bring adequate rainfall to the whole country. In the North Island, owing to the absence of a high and continuous mountain

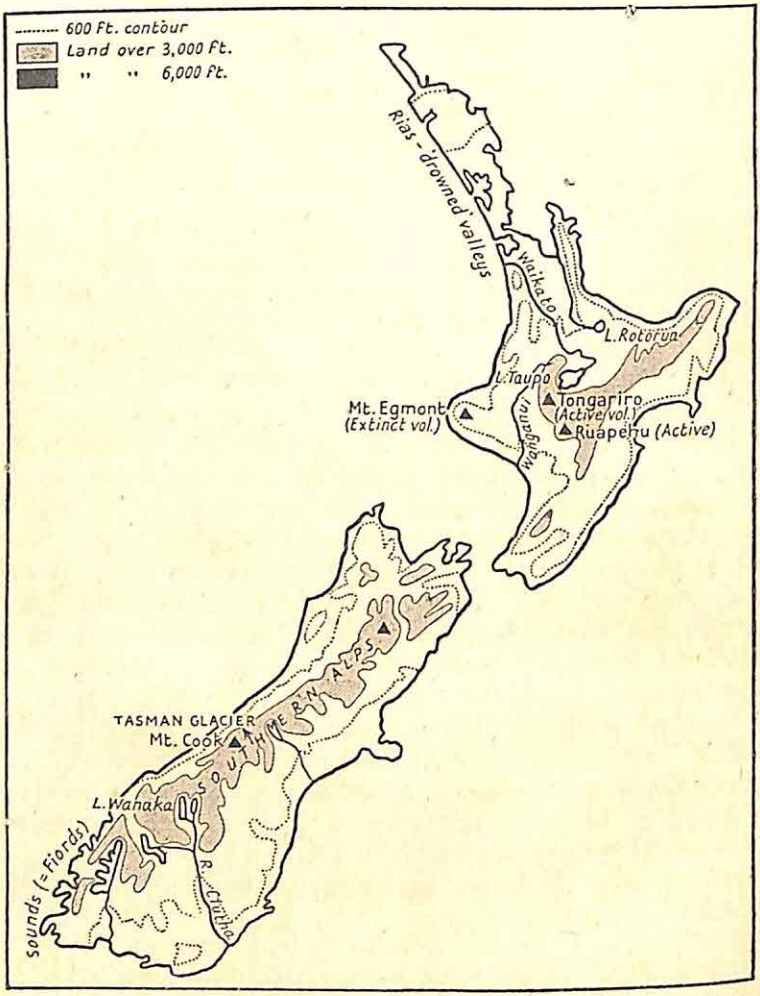


FIG. 304. New Zealand: Structure and Relief.

belt, rainfall is fairly evenly distributed, and even in the 'Mediterranean' north of the island there is no dry season, though the winter months are wettest. In the South Island the rainfall on the windward

side of the Southern Alps is heavy, in many districts exceeding 100 inches per annum. The east, lying in the rain shadow of the mountains, is drier, receiving on an average somewhat less than 30 inches.

Natural Vegetation, Crops, and Animals. The damp climate of New Zealand favours the growth of trees. The windward side of the Southern Alps and the more mountainous parts of the North Island are extensively forested, but much land has been cleared and

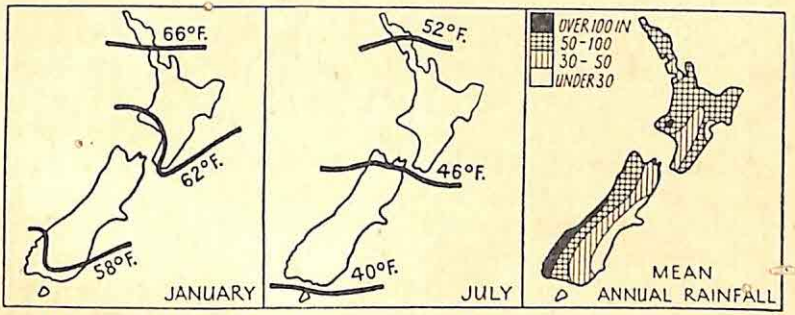


FIG. 305. New Zealand: Temperature in Summer (January) and Winter (July); and Mean Annual Rainfall.

forms, together with the eastern plains, a pastoral area. All the indigenous trees are evergreen. Among them are southern-beeches and pines, luxuriant tree ferns, and the Kauri pines of the Auckland Peninsula.

There are no native wild animals and no snakes, and thus many birds, like the very rare kiwi, having no foes from which to fly, lost the use of their wings. Sparrows and rabbits, introduced by early settlers, are common, and the latter especially have become a plague to farmers owing to the damage they do to pasture and crops. The blackberry has also become a pest in some districts, as it spreads very rapidly.

Wheat and oats are produced mainly for home consumption: the former is grown chiefly on the Canterbury plains, the latter on the poorer soils of the somewhat cooler region of Southland. The introduction of refrigeration brought prosperity to the New Zealand farmer, for it opened up distant markets for frozen meat and dairy produce, and thus much land, once under wheat, has now been laid down for pasture. In many districts the natural pastures have been

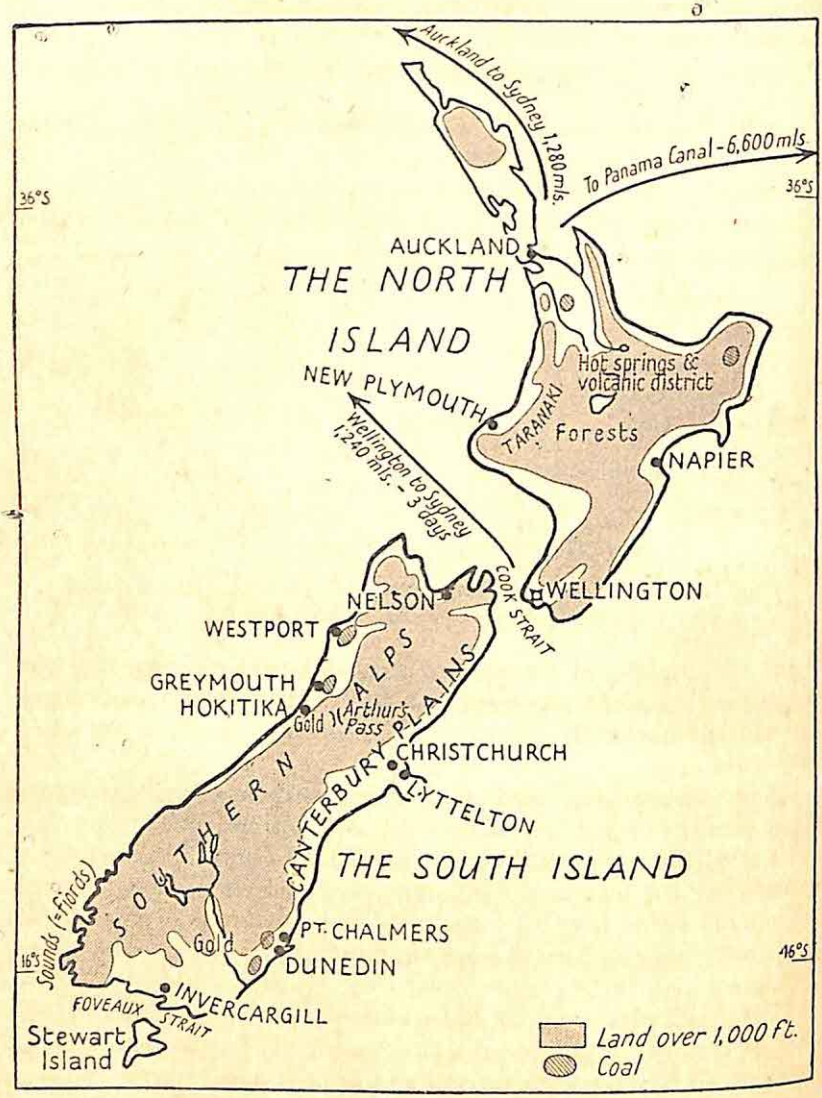


FIG. 306. New Zealand: General and Economic.

improved by sowing English grasses, which are more luxuriant than the coarser native varieties.

New Zealand is primarily a pastoral land, and sheep farming and dairying are the main occupations. The chief sheep-farming districts are in the drier east; cattle are bred in the wetter west, and, thanks to the mild climate, stock can remain in the open throughout the year. In the drier regions of Australia sheep are grazed mainly for wool, but in New Zealand, where even the drier areas have, as a rule, a heavier rainfall, the farmer favours breeds of sheep that will produce good meat as well as wool. Though Australia has nearly four-times as many sheep as New Zealand, yet the latter country exports five times as much mutton.

For a similar reason, cattle are bred for dairying rather than for beef, and New Zealand, with less than one-quarter the cattle of Australia, exports somewhat more butter, and eleven times as much cheese, in addition to condensed milk and subsidiary products.

Skim milk is used to fatten pigs, which provide bacon, hams, and pork for the home and export markets. Most of the dairy farms are small, and their owners, like those of Denmark, co-operate for the manufacture of their produce, which is carefully graded. The Government market the output. They pay a guaranteed price for the whole of it; and neither the farmers themselves nor the co-operative butter and cheese factories have, therefore, any direct responsibility for the sale of the produce.

Natural Regions of the North Island. (1) *The Auckland Peninsula* and the lowlands to the south. Owing to subsidence, the coast of the long, narrow Auckland Peninsula is broken by a number of inlets of the *ria* type, most of which are, however, too shallow to be of much use as harbours. The peninsula is the home of the kauri pine, which yields hard timber, and also gums used in the manufacture of high-grade varnish. The once extensive forests have been much depleted, and the once important gum industry—including the digging of fossilized gum—has almost died out. Dairying is carried on, notably in the rich alluvial plains of the lower Thames and Waikato. The latter, unlike most New Zealand rivers, is navigable for part of its course. The modified Mediterranean climate favours the cultivation of vines and other warm temperate fruits. *Auckland* (212,000), the largest town in New Zealand, has a harbour

on both sides of the island, but, as that on the west is shallow, the eastern one is used by ocean vessels sailing to the Panama Canal and American ports; and to Sydney, 1,280 miles distant.

(2) *The Volcanic District* lies around Lake Taupo, the largest sheet of water in New Zealand. Most of the Maoris live in this region, and many tourists visit it to see the geysers, hot springs, and the volcanic cones of Ngauruhoe, Tongariro, and Ruapehu.

(3) *The Mountainous South-East*, lying on the drier side of the island, is mainly a sheep-grazing area. *Napier* is the chief town.

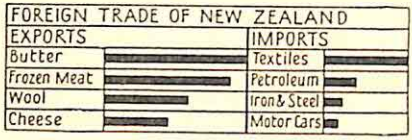


FIG. 307.

though Hastings is growing in importance. This region is subject to occasional earthquakes.

(4) *The Pastoral Plains and Uplands of the South-West* include the Taranaki district and the fertile Wellington Plains. The damp climate is ideal for cattle rearing, and the whole region, especially the Taranaki area, is noted for dairying. *Palmerston North* is the chief town in the north-west. *Wellington* (150,000), on a magnificent hill-girt harbour, was chosen to be the capital of New Zealand on account of its central position.

Natural Regions of the South Island. (1) *The Southern Alps* are a region of unexcelled beauty; while in the south-west corner the steep-sided fiords, called sounds, rival in charm those of Norway or British Columbia. The rivers are useless for navigation, but their waters provide potential and developed hydro-electric power which is increasingly used in factory and farm. The chief occupations of the isolated strip along the west coast are mining and lumbering. *Westport* and *Greymouth* both export coal mined in the vicinity, and *Hokitika*, south of Greymouth, is a centre for alluvial gold. From Greymouth a railway to Christchurch climbs the forested uplands to Arthur's Pass, passing under the summit through the Otira Tunnel, the longest in the British Empire.

(2) *The East Coast Region* may be divided into the Canterbury

Plain and the Otago Plateau. The former region has been built up of morainic material deposited by rivers after the melting of the ice-sheet that once covered the Southern Alps. Wheat, oats, potatoes, and fodder crops are grown, but sheep farming is the main occupation. *Christchurch* (132,000), the chief town in the South Island, is connected by rail with the port of *Lyttelton* lying to the north of Banks Peninsula. From Christchurch a line runs southward to *Dunedin* (89,000), crosses the Clutha river, whose sands are dredged for gold, and makes for *Invercargill* (25,000), the principal town of Southland, the chief district in the Dominion for oats, which thrive in a damp climate and on poor soils.

(3) *The Tasman Bay–Marlborough Region.* This small area, lying around Tasman Bay and along the east coast of the Marlborough province, is noted for its apples and its cereals. The former are grown round *Nelson.*

EXERCISES

1. (*a*) Draw a sketch-map of New Zealand and on it show, by suitable shadings, the chief cattle and sheep-farming areas. (*b*) How do you account for the fact that more than half the sheep and four-fifths of the cattle are bred in the North Island, but that the greater part of the wheat is grown in the South Island?

2. Fig. 307 shows the comparative value of the chief exports and imports of New Zealand. What can we learn from the above about the geography of the country?

3. On a sketch-map of New Zealand (*a*) Shade the land over 1,500 feet. (*b*) Name the Southern Alps. (*c*) Name the Hot Spring District and mark and name a large lake in this area together with the river draining it. (*d*) Show by arrows the direction of the prevailing winds. (*e*) Indicate the chief coal-fields. (*f*) Mark and name six of the chief towns. (*g*) How do you account for the fact that all of these towns are ports?

4. Draw a fully labelled sketch-map to show why Wellington is important. Why do you think this town was chosen to be the capital of New Zealand?

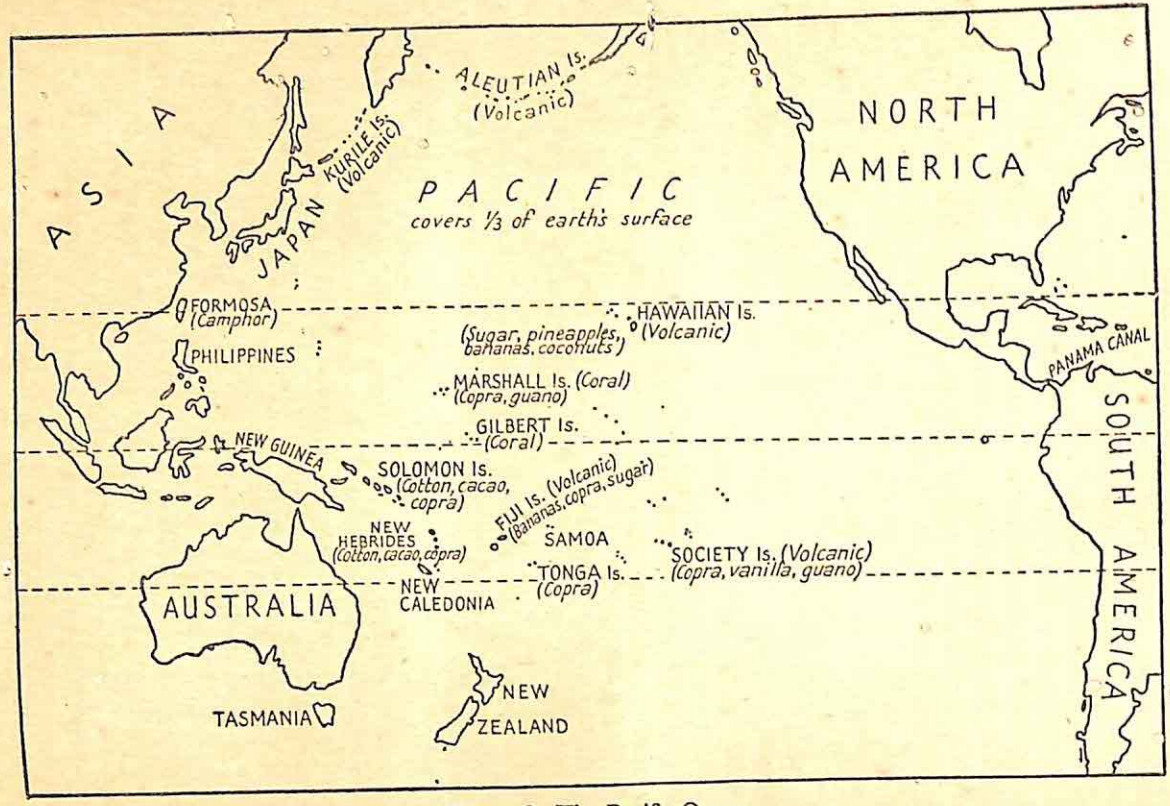


FIG. 308. The Pacific Ocean.

CHAPTER XXXIV

THE PACIFIC ISLANDS

THE PACIFIC

THE Pacific Ocean covers one-third of the earth's surface and contains some of the greatest known depths. Its islands (excluding those off the coast of Asia) are found mainly in the south. They may be divided into (1) *Continental Islands*, such as New Guinea, New Caledonia, and the Bismarck Archipelago, situated on the continental shelf of Australia; and (2) *Oceanic Islands* (Fig. 308).

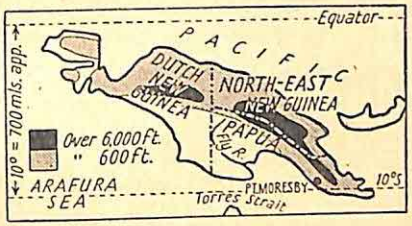


FIG. 309. New Guinea.

CONTINENTAL ISLANDS

New Guinea, stretching from the equator to 10° S., is, with the exception of Australia, the largest island in the world. It is separated from the latter by Torres Strait and the Arafura Sea. The island is crossed from east to west by ranges which occupy the centre and north. Owing to the low latitude temperatures are uniformly high, except in the highlands, and rain falls throughout the year. The north of New Guinea receives, however, most rain during the southern summer, when the north-west monsoon winds are blowing from Asia towards Australia. In the south the rainfall is heaviest in the southern winter, when the south-east winds are blowing towards South-East Asia.

Dense impenetrable forests spread from the lowlands almost to the crests of the mountains; while along the coasts are many coconut plantations yielding copra and allied products, and banana trees which, with yams, taro, sago, and fish, form the staple foods of the

natives. These are mainly of Papuan origin, but there is much race intermixture among the coastal peoples, who are seamen and fishermen. In the little-known interior live primitive tribes, including pygmies, many of whom are still in the Stone Age. Minerals, including copper and gold, are abundant, but so difficult are communications that none except gold is worked. The chief mines lie in British territory. Transport to the coast, 70 miles distant, is by aeroplane.

The west of New Guinea is Dutch. The east, which is British, is divided into *Papua*, governed by Australia (chief settlement Port Moresby), and the Mandated Territory (formerly German) of North-Eastern New Guinea. The islands of the adjacent *Bismarck Archipelago*, and the (volcanic) *Solomon Islands*, to the west of the latter, are also governed by Australia under a mandate from the League of Nations.

New Caledonia, somewhat larger than Wales, is French. It is rich in minerals, notably nickel, iron, and manganese. The chief crops are coffee, coconuts, and cotton.

OCEANIC ISLANDS

By far the greater number of the oceanic islands in the Pacific lie in tropical latitudes. As nearly all are in the trade-wind belts their climate is mild and equable: the higher islands receive heavy rain on their windward sides, but some of the low coral islands suffer from drought.

The island folk, numbering somewhat more than a million, may be divided into Micronesians, Melanesians, and Polynesians. The Melanesians, who are found mainly west of longitude 180°, are a black, frizzy-haired people. The Polynesians, whose island homes are chiefly east of longitude 180°, are taller than the Melanesians, and have brown skins and dark hair.

Most of the oceanic islands are either *low* coral islands, like the Marshall and Gilbert Islands, or *high* volcanic islands, such as the Hawaiian, Fiji, and Solomon Islands.

Coral Islands. The *low* islands have been formed by the coral polyp, which builds only in calm, clear, warm, and comparatively shallow salt water. In the open ocean coral islands rise from submarine ridges and peaks whose summits are not far below the surface. As the polyps cannot build above sea-level, newly formed islands are

almost awash. But gradually blocks of coral, broken by the waves, are piled up on the surface, thus increasing the height, until in time the island reaches an elevation of 10 to 12 feet, and in the case of old islands of as much as 30 feet above sea-level.

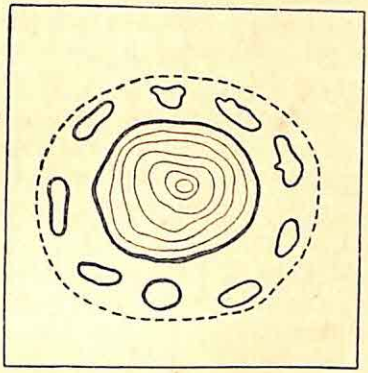


FIG. 310. Fringing Reef round high volcanic island.

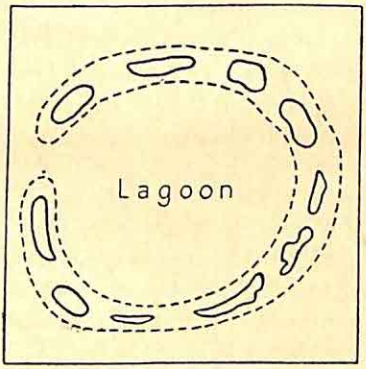


FIG. 311. Coral Atolls.

There are three types of coral islands. *Fringing reefs* grow close to and around other islands, which are often of volcanic origin. *Barrier Reefs*, like the Great Barrier Reef of Australia, lie some distance from the land and usually descend to considerable depths on their seaward side. *Atolls* are belts of coral, often more than a mile wide, circular, oval, and sometimes triangular in shape, which enclose

expanses of water called *lagoons*. The lagoons generally, though not always, have an entrance—often deep enough to allow the passage of large ships—on the side opposite the prevailing winds. They vary in size. Some are relatively small, but others are quite large, one in the Marshall Islands actually measuring 100 miles across.

The vegetation on coral islands is usually limited to coconut and pandanus (or screw) palms which, springing from the broken coral, meet almost every need of the inhabitants. The chief product is copra. But, truth to tell, romantic though they sound, palm-fringed atolls are uncomfortable homes. Yet since 1935 some of the hitherto isolated and uninhabited atolls that dot the Pacific wastes have attained a new importance, for their lagoons provide bases for flying boats on trans-Pacific routes (see p. 430).

Volcanic Islands. The *high* volcanic islands, which are much larger than the coral islands, rise steeply from the ocean, but their rugged outline is softened by masses of luxuriant vegetation. Their palm-fringed beaches margin a narrow plain, built up by sediment brought down by streams, where such crops as rice, sugar-cane, yams, and pineapples are grown. Among the chief volcanic groups are the Fiji, Samoan, and Hawaiian Islands.

The *Fiji Islands* (British), whose total area is slightly less than Wales, lie between latitudes 15° S. and 22° S. on both sides of longitude 180°. The largest islands, Viti Levu and Vanua Levu, produce bananas, sugar-cane, pineapples, and coconuts. Suva, the capital, stands on a magnificent harbour in Viti Levu.

The Western *Samoan Islands* to the north, formerly German, now administered by New Zealand under a mandate from the League of Nations, yield copra, cacao, and bananas. Nauru, an atoll 26 miles south of the equator, is also governed by New Zealand. Like Ocean Island (British), it is noted for its phosphate deposits.

The Hawaiian Islands belong to the United States. Their climate resembles that of the Fiji group, for though they lie north of the equator, they are situated in similar latitudes. On the southern lowlands of Hawaii, the largest island, quantities of sugar-cane and pineapples are grown. In the centre of this island the enormous volcano of Mauna Loa rises over 13,000 feet above sea-level, and more than 30,000 feet above the ocean bed. *Honolulu*, the capital and the best equipped port in the Mid-Pacific, is a focus of trans-Pacific steamship routes, as well as an important naval and air base.

Most of the trade of the Hawaiian islands is with the United States, goods being shipped from Honolulu to San Francisco, 2,580 miles (5 days) distant.

EXERCISES

1. How are the coral islands formed? Describe, with examples of each, the chief types of coral islands. Discuss the present and future importance of coral islands in the Pacific.

2. What do you understand by a *High Island*? Name the chief *high island* group in the Pacific belonging to the United States. What is the name of its capital? Use your atlas to find the distance of this port from San Francisco, the Panama Canal, Valparaiso, Samoa, Sydney, Manila (Philippines), Shanghai, and Seattle.

3. A roughly circular island, about 300 square miles in area, is situated in the Mid-Pacific: latitude 10° N., longitude 160° E. (approximately). It is of volcanic formation. In the centre of the island is a volcanic cone rising to 7,000 feet. (*a*) Draw a contour map of the island. Insert contour lines every 1,000 feet. Show by arrows the direction of the prevailing winds. Mark the wetter sides of the island. (*b*) State what crops you would expect to be grown on the island and in what districts they would probably flourish. Give your reasons.

4. Using your atlas, draw a sketch-map showing a possible trans-Pacific air route from Vancouver to (i) Sydney and (ii) Auckland, calling, so far as possible, at British islands *en route*.

TEST PAPER: AUSTRALIA, NEW ZEALAND, AND THE PACIFIC ISLANDS

PART I

1. Draw a map of Australia, naming the surrounding oceans, and the ocean currents washing its shores. Show the relation of the currents to the prevailing winds.

2. (*a*) Describe and compare the *two* most important sea routes from Australian ports to England. (*b*) What route is followed by *sailers* and why do they follow this route? (*c*) How long does it take to travel from Sydney to England (i) by steamer, (ii) by air?

3. Show how modern developments in ocean transport have affected the stock-rearing and fruit-growing industries of Australia and New Zealand? What advantages and disadvantages for trade with Britain has Australia compared with the Argentine?

4. (*a*) What geographical conditions have contributed towards making Australia the leading sheep-producing country in the world? (*b*) How do you account for the fact that though New Zealand has only one-third as many cattle as Australia, yet her exports of butter are two and a half times as great?

5. (*a*) Draw a map of Australia to show the chief belts of natural vegetation. Show how these belts are related to the climatic conditions. (*b*) Select one belt and describe the occupations of the inhabitants.

PART 2

6. Compare Australia with South Africa, under the headings: relief and structure, climate, natural vegetation, minerals.

7. Select three island groups in the Pacific Ocean. Describe their position, chief products, and their importance to the country owning them.

8. Describe the relief of the South Island of New Zealand, and show how it is related to the rainfall, natural vegetation, and occupations of the people.

9. New Zealand is often called the *Britain of the South*. Discuss this statement and say how far you think it is justified.

10. Write notes on (*a*) irrigation in Australia; (*b*) the development of hydro-electric power in New Zealand; and (*c*) the indigenous animals of Australia.

APPENDIX

THE BRITISH EMPIRE AND COMMONWEALTH

THE British Empire covers 13,335,000 square miles, or more than one-fifth of the land surface of the world, and within its borders live 495 million people, or one-fourth of the human race, united by their common allegiance to King George VI. Exploration and conquest have played their part in building up the Overseas Empire, which includes the *Dominions*, equal partners with Britain in the Commonwealth, and the *Colonial Empire*, whose population is actually somewhat greater than that of the entire French Overseas Empire, the next in importance and size to that of Britain.

The British Empire and Commonwealth consists of:

1. *Great Britain and Northern Ireland.*

2. The *Dominions*, whose status as 'autonomous communities within the British Empire . . . united by a common allegiance to the British Crown, and freely associated as members of the British Commonwealth of Nations', was recognized in 1931 by the *Statute of Westminster*.

The *Dominions* are: Canada, Australia, New Zealand, and the Union of South Africa; India and Pakistan which became independent in 1947, and Ceylon which acquired Dominion status in 1948. Newfoundland relinquished her Dominion status in 1933.

3. *Eire* is described as 'an independent republic associated, as a matter of external policy, with the British Commonwealth'.

4. The *Crown Colonies* and *Protectorates*, which are controlled by the Imperial Government acting through the Colonial Office. Some of the Colonies, such as Southern Rhodesia, are self-governing; others are governed almost entirely through the Colonial Office. The Protectorates, though administered by the Colonial Office, are not actual 'colonies'.

The chief Colonies, Crown Colonies, and Protectorates are:

Africa: Kenya and Uganda, Zanzibar, Nyasaland, Somaliland, Northern Rhodesia and Southern Rhodesia, Basutoland, Swaziland, Bechuanaland, Nigeria, Gold Coast, Sierra Leone, and Gambia. Included in Africa are Mauritius and the Seychelles, in the Indian Ocean.

Asia: Cyprus, Aden, Ceylon, Hong Kong, British Malaya.

Central and South America and the West Indies: British Honduras; Jamaica, Trinidad, the Bahamas; British Guiana, the Falkland Islands.

Atlantic: The Bermudas and St. Helena.

Europe: Gibraltar and Malta.

Australasia and the Pacific: Fiji, Western Samoa, British North Borneo, New Guinea (Papua and North-Eastern New Guinea), and a number of other islands in the Pacific.

5. The *Mandated territories* are administered by the Imperial or Dominion Governments under mandates from the *League of Nations*. The chief are: Tanganyika and South-West Africa.

6. The *Anglo-Egyptian Sudan* is ruled by a Governor-General, appointed by Egypt with the assent of Great Britain, and administered by British District Commissioners.

The chief Empire *Sea Routes* are: (i) Liverpool to Montreal and Halifax; (ii) Southampton and London to India, Ceylon, Singapore, Hong Kong, Australia, and New Zealand via the Suez Canal; (iii) London to Cape Town, and thence to Australia and New Zealand; (iv) Liverpool to British ports on the Guinea Coast of Africa; (v) London to New Zealand and Australia via the Panama Canal; (vi) Vancouver to Australia and New Zealand.

Three important *Empire Air Routes* are (i) London (Croydon) to Palestine, India, Singapore, and Australia (Sydney); (ii) London to Durban via Khartoum, Nairobi, Mombasa, and Dar-es-Salaam and (iii) London to Foynes (Eire), and thence across the Atlantic to Port Botwood (Newfoundland).

Cables and Wireless also form important links in Empire communications. The stations of the 'All-Red Route' are entirely in British Territory. From Rugby and other powerful transmitting stations it is possible to send and receive messages from all parts of the British Empire. By the *beam* wireless system people living in the British Empire can actually *speak* to those living in Canada, Australia, South Africa, and India.

Aachen, 195, 227.
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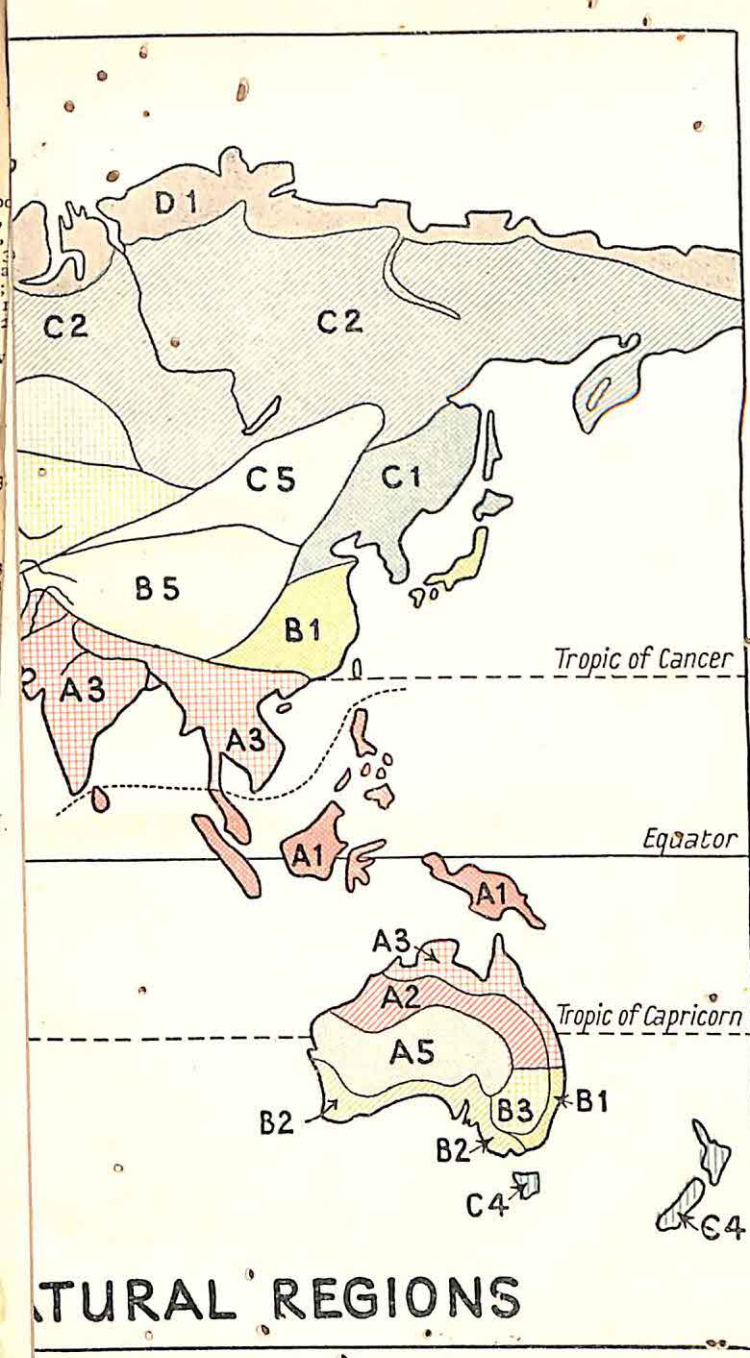

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